

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

In re <i>Inter Partes</i> Reexamination of:	)	
	:	Examiner: LOPEZ, CARLOS N.
JOSEPH A. PATCHETT ET AL.	)	
	:	Group Art Unit: 3991
Patent No. 7,229,597	)	
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Issued: June 12, 2007	)	
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Control No. 95/001,745	)	
	:	
Reexam Filed: September 7, 2011	)	
	:	
For: CATALYZED SCR FILTER AND	)	March 9, 2012
EMISSION TREATMENT SYSTEM	)	

**Mail Stop *Inter Partes* Reexam**  
 Commissioner for Patents  
 P.O. Box 1450  
 Alexandria, VA 22313-1450

**Third Party Comments After Patent Owner's Response Under 37 C.F.R. § 1.947**

Madam:

The following is the Requester's response to "Patent Owner's Amendment and Response Under 37 C.F.R. § 1.941" as well as the attachments thereto filed on February 8, 2012, and to the Office Action dated November 30, 2011.

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## REMARKS

### I. Introduction

The Patent Owner fails to overcome rejections set forth in the Office Action dated November 30, 2012 (hereinafter "Office Action").

The claims of U.S. Patent No. 7,229,597 (hereinafter "the '597 patent"), are directed to an emission treatment system having a wall flow monolith that comprises a **washcoat**, i.e., coating, of SCR catalyst composition that **permeates** the walls of the monolith. However, the prior art of record, i.e., Ohno, Pfeifer, Araki and Nakanishi, make very clear that it was well known to provide a catalytic **washcoat** that **permeates** the walls of a relatively high porosity filter so as to avoid undesirable backpressure resulting from the catalyst loading. See also Hashimoto, S. et al., "SiC and Cordierite Diesel Particulate Filters Designed for Low Pressure Drop and Catalyzed, Uncatalyzed Systems," SAE Technical Paper Series, 2002-01-0322, col. containing Figure 21 (Mar. 2002) (Hashimoto) (copy attached). This prior art reference discloses that the relatively high porosity (59%) filters having a mean pore size of 25 microns (in fact, not coincidentally, it appears the same filters were used in the Example of the '597 patent)<sup>1</sup> were loaded with relatively high levels of catalytic **washcoat within the pores of the filter, e.g., 100g/l (1.64g/in<sup>3</sup>)**, while maintaining favorable back pressure performance more than one year prior to the filing date of the '597 patent. Accordingly, the addition of the term washcoat to the claims does not distinguish over the prior art.

The Patent Owner also attempts to distinguish over the combinations of art that include Ohno by arguing that Ohno teaches away from the application of a washcoat of catalyst to a high porosity wall flow monolith. The Patent Owner's arguments, however, are based both on an inaccurate construction of the term washcoat, and on an inaccurate reading of Ohno. As will be explained below, and as supported by the Expert Declarations being filed concurrently herewith, Ohno actually teaches that washcoating compositions should be applied to a wall flow monolith in a manner that distributes the washcoating composition through the wall surface and into the network of pores, thereby preventing pressure loss due to the catalyst clogging pores. Thus, Ohno does not teach away from the application of a washcoat, i.e., a coating, of SCR catalyst, to

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<sup>1</sup> The catalyzed wall flow filters disclosed in Hashimoto were actually prepared by Engelhard Corporation, the predecessor in interest of the Patent Owner. Hashimoto, Acknowledgments.

a wall flow monolith, and it follows that Ohno in combination with the other prior art renders the claimed invention obvious, as set forth in the adopted rejections.

Moreover, in arguing that Ohno teaches away from a washcoat, the Patent Owner inaccurately construes the term “washcoat” to include a specific process of applying catalyst. The term is not defined in the ‘597 Patent. The prior art, however, as well as the declarations of experts in applying catalytic washcoating compositions to filters, filed herewith, definitely establish that the proper construction of “washcoat” is the resulting coating that is applied to a substrate with a fluid. Notwithstanding the washcoating technique used to apply the coating, the end result is a coating. The claims of the ‘597 Patent recite an emission treatment system, not a method of producing such a system or a process of applying a catalyst to an article in a system. Thus, the addition of the term “washcoat” does not distinguish over Ohno and the prior art cited in the rejections, and the amended claims should be rejected as obvious over the art of record.

The Patent Owner also argues that the Schafer-Sindlinger and Tennison references, which are cited in the proposed rejections for teaching features of the claimed system in conjunction with a wall flow monolith having SCR catalyst, teach away from the claimed invention. With respect to Schafer-Sindlinger, the Patent Owner asserts that the reference teaches a catalyst loading that is contrary to the catalyst loading set forth in Ohno. The Patent Owner’s argument, however, fails to consider the collective teachings of Schafer-Sindlinger and Ohno. In particular, Ohno teaches that washcoating catalyst compositions should be loaded on a wall flow monolith in a manner that distributes the catalyst through the wall surface and into the network of pores, thereby preventing pressure loss caused by the application of a thick washcoat that would clog the pores. As will be explained more fully below, one of ordinary skill in the art would readily appreciate this teaching of Ohno when combining the reference with Schafer-Sindlinger. With respect to Tennison, the Patent Owner argues that the combination would require the redesign and reconfiguration of the system of Tennison. As will be explained below, however, this argument fails to address the actual rejection and how the combined teachings of the cited references render obvious the claimed system.

The Office Action does not adopt some of the proposed rejections set forth in the Request for Reexamination. The Office Action’s reasoning for not adopting the rejections, however, is not correct, as will be discussed below. Requester submits herewith testimony of experts having significant experience loading catalysts onto filters. Those experts make clear that a person of

ordinary skill in the art seeking to load a relatively high porosity wall flow filter with an SCR catalyst composition would have considered known techniques for loading the same filters with a soot combustion catalyst or a NO<sub>x</sub> adsorber. The art cited in the non-adopted rejections renders obvious claims of the '597 Patent, as will be explained below.

Requester also proposes new art rejections based on the recently discovered Hashimoto reference. This reference makes clear that high porosity diesel particulate filters, i.e., wall flow filters, were in fact designed to provide low pressure drop even with significantly higher catalytic washcoat loadings. The prior art teaches and suggests the inclusion of an SCR catalyst on a high porosity wall flow filter in conjunction with the rest of the claimed system components. Thus, all the claims are rendered obvious either over Hashimoto in view of the other cited art, as discussed below.

## **II. The Proper Construction of "Washcoat" in the Amended Claims Means a Coating**

The Patent Owner asserts at page 10 of the Amendment that "[a] washcoat is understood to a person of ordinary skill in the art as conventional powder dispersion in a liquid vehicle applied to a substrate such that upon drying, the powder remains as a coating." While the '597 Patent may describe a method of slurry coating at col. 10, lines 4-22, it is clear that what results is a coating of the SCR catalyst on the wall of the filter. The claims of the '597 Patent are directed to an emission treatment system. Thus, the process by which the coating is applied does not distinguish over the prior art.

In fact, a washcoat is very well known as a coating layer that incorporates a catalyst. *See, e.g.,* Heck, R.M. et al., "Catalytic Air Pollution Control," 18 (2d ed. 2002) (Heck) ("The catalyzed coating is composed of a high-surface-carrier such as Al<sub>2</sub>O<sub>3</sub> impregnated with a catalytic components. This is referred to as the *catalyzed washcoat*." (Emphasis in original). *See also,* Plummer, Jr., H.K. et al., "Measurement of Automotive Catalyst Washcoat Loading Parameters by Microscopy Techniques," 5 *Microsc. Microanal.*, 267, 267 (1999) ("A typical automotive exhaust catalyst consists of a monolithic ceramic substrate (commonly cordierite) that is coated with an active catalyst *layer* referred to as washcoat." (Emphasis added). Moreover, the '597 Patent refers to "SCR catalyst composition" and "SCR catalyst washcoat" interchangeably ("Achieving practical levels of *SCR catalyst composition* on the wall flow substrate is important for providing sufficient catalytic activity to achieve mandated NO<sub>x</sub> reduction levels, and for lowering the combustion temperature of the soot fraction trapped on the

filter. Achieving adequate levels of *SCR washcoat compositions* on the soot filter is also important to secure adequate durability for the catalyst.” ‘597 Patent, col. 6, ll. 41-47 (emphasis added)). Thus, it is clear that as used in the claims of the ‘597 Patent, washcoat simply refers to the dried coating, and that coating includes an SCR catalyst composition that permeates the wall flow monolith.

Requester has filed herewith a Declaration of Dr. Phillip Blakeman (hereinafter the “Blakeman Declaration (A)”), who has a significant amount of expertise in the catalytic coating of filters. As explained by Dr. Blakeman, a person of ordinary skill in the art would have understood that a washcoat is the resulting coating that remains on a substrate after a washcoating composition is applied. Blakeman Decl. (A), ¶5. The physical form of the washcoating composition is not restricted to a powder dispersion in a slurry, but encompasses all fluid forms such that, when the fluid is removed after the coating process, a coating remains, resulting in a washcoat on the substrate. *Id.* Dr. Blakeman further opines that a washcoat is a coating that results from any washcoating technique, including, for example, application of a washcoating composition via slurry, sol gel, or solution. *Id.* According to Dr. Blakeman, it was well known at the filing date of the ‘597 patent that applying a washcoating composition to a substrate with any fluid medium would result in a coating that is a washcoat. *Id.*

In fact, it was well known that a catalyst, such as Pt, could be deposited by solution impregnation on high-surface-area  $\text{Al}_2\text{O}_3$  and that “[w]hen the  $\text{Al}_2\text{O}_3$  is bonded to a monolithic honeycomb support, . . . it is called a *washcoat*.” (Emphasis in original). Heck, at 5-6. It was also well known that a catalytic washcoat could be applied to a substrate using a sol gel binder and that the washcoat layer often contains a binder. *See, e.g.*, U.S. Patent Application Pub. No. 2003/0040425, para. [0043] (“The catalytic material/binder system forms the catalytic washcoat composition which is then coated onto the monolithic structure.”). Thus, it is clear that there were numerous techniques known at the filing date of the ‘597 Patent to obtain a washcoat of a composition on a substrate. It was also well known that such coatings may, and often do, contain a binder.

The specification and claims of the ‘597 Patent certainly nowhere preclude the use of a binder from the washcoat. Dr. Blakeman, in fact, opines that washcoating compositions can often contain binders to assist in binding the washcoat to the substrate. Blakeman Decl. (A), ¶5. Although not explicitly stated, the Example set forth in the ‘597 patent employs  $\text{ZrO}_2$  as a binder



to assist in maintaining the coating on the substrate. Col. 12, l. 30; *see* Declaration Under 37 C.F.R. § 1.131 by Joseph C. Dettling, Exhibit A (“The catalyst also contains excess copper oxide and an inorganic binder, in this case  $ZrO_2$ .”). Nor does the fact that the ‘597 Patent exemplifies the use of a slurry in a washcoating technique change the fact that the resulting catalytic layer is a “coating”. Certainly, none of the claims of the ‘597 Patent exclude an alumina washcoat.<sup>2</sup> Thus, as the claims of the ‘597 patent are to an emission treatment system, the term “washcoat” would have been recognized by a person of ordinary skill as a coating. The Patent Owner has not alleged that its washcoat is not a coating or that the “powder” which clearly may include a binder and which “remains as a coating” is somehow not a coating.

As noted by Dr. Blakeman and as shown by the prior art referred to herein, the definition of “washcoat” as the “well understood meaning to a person of ordinary skill in the art” is overly restrictive<sup>3</sup>. A person of ordinary skill would have been well aware that a washcoat is a coating that has been applied with a fluid. *See* Blakeman Decl. (A), ¶5, and the prior art references referred to herein. *See also* Walker Decl. (C), ¶¶8 and 14. With respect to Dr. Haller’s opinion, although Requester notes that while Dr. Haller’s curriculum vitae evidences a significant amount of experience in the study of catalysis, there is little evidence of any significant experience in the science of loading catalyst onto filters. In any event, the facts presented by Requester as well as the opinion of persons having significant expertise in catalyst filter technology make clear that the proper definition of a washcoat is a coating on a substrate that has been applied with a fluid. By failing to recognize this broad definition of a washcoat and that there are different types of washcoating techniques that result in a washcoat, Dr. Haller fails to recognize that Ohno teaches a washcoat that is dispersed throughout the walls of the filter. Moreover, as previously stated, because the claims presented by the ‘597 Patent are directed to an emission treatment system, it is clear that washcoat is a coating, and how it was applied is immaterial.

Additionally, claim terminology in a reexamination proceeding is to be given the broadest reasonable interpretation consistent with the specification and consistent with the

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<sup>2</sup> Even Dr. Haller ultimately concludes that the result of the application technique described in the ‘597 Patent is a “coating”. *See* Declaration of Gary L. Haller, ¶10, filed in Reexam Control No. 95/001,744 for U.S. Patent No. 7,902,107, which claims priority to the ‘597 Patent, attached herewith.

<sup>3</sup> The Patent Owner attempts to use extrinsic evidence to define the term “washcoat” because it is not defined in the ‘597 Patent. As shown herein, however, by testimony of experts as well as contemporaneous prior art, the meaning that a person of ordinary skill would have given to the term “washcoat” is much broader than suggested by Dr. Haller.

interpretation that those skilled in the art would reach. *In re Yamamoto*, 740 F.2d 1569 (Fed. Cir. 1984). The specification of '597 Patent does not provide the express definition of a "washcoat" asserted by the Patent Owner, and as discussed above, one of ordinary skill in the art would have understood the term to mean a coating on a substrate. Accordingly, that interpretation should be applied to recitation of a "washcoat" in the claims of the '597 Patent.

### **III. Amended Claims 1, 14 and 15 and Original Claims 2-13**

#### **A. Ground 1 - Rejection of Claims 1-8 and 10-15 as being obvious over U.S. Patent Application Pub. No. 2002/0039550 (Schafer-Sindlinger) in view of WO 02/26351 (Ohno)**

##### **1. Ohno Teaches a Catalytic Washcoat that Permeates the Walls of a Wall Flow Filter**

At pages 11-13 of the Amendment, the Patent Owner asserts that Ohno teaches away from application of washcoats to wall flow monoliths. A careful reading of Ohno shows this is incorrect.

First, Ohno clearly teaches a "washcoat" as that term is correctly interpreted. As discussed above, a washcoat simply refers to the dried coating, and that coating includes an SCR catalyst composition that permeates the wall flow monolith. In Ohno, the high porosity filter is covered with a thin alumina film that is dispersed throughout the wall of the substrate. Ohno, p. 12, ll. 20-26, p. 20, ll. 13-15. The resulting thin alumina film is in fact a washcoat as it is deposited from a solution of metal compound to form a coating on the ceramic substrate. In fact, prior to the filing date of the '597 Patent, the sol-gel method was a well known technique used to create a coated filter substrate. *See, e.g.*, U.S. Patent Application Pub. No. 2003/0040425, para. [0003], which describes a method of washcoating a catalytic material using a silica sol and alumina sol binder system. While Ohno does not describe the application of a slurry, the result using the disclosed technique is still the same, *i.e.*, a coating. Moreover, the application of a slurry does not *per se* affect the performance of the catalytic material. *See* comparative example, Catalyst B1, of the '597 Patent. In addition, the '597 Patent does not claim a method of application. It claims an emission treatment system that includes a wall flow monolith with a washcoat of an SCR catalyst, *i.e.*, a coating of an SCR catalyst composition that permeates the walls of the wall flow monolith. *In re Pilkington*, 411 F.2d 1345, 1348 (C.C.P.A. 1969) ("The patentability of a product does not depend on its method of production."). In sum, Ohno

describes coating a wall flow monolith with a thin film of alumina carrying a catalyst. Ohno, p. 22, ll. 3-6. While Ohno describes applying a catalyst using an aqueous solution, once the monolith is dried, the result is still a catalytic coating, *i.e.*, a washcoat comprising a catalyst.

The Patent Owner has also misinterpreted the disclosure of Ohno. To support its assertion that Ohno teaches away from the application of a washcoat to a wall flow monolith, the Patent Owner points to an excerpt from page 2, lines 6-9 of Ohno that recites “even if the pore size and porosity are made large, if coated with a catalyst, pressure loss conversely ends up becoming larger”. However, as pointed out by Dr. Walker in the concurrently submitted Declaration (hereinafter, the “Walker Declaration (C)”), this assertion ignores the very next paragraph of Ohno, at page 2 lines 10-13, that makes clear the importance of using a filter having “an average pore size of 10 to 250 microns and a porosity of 40 to 80% or 40 to 70%.” Walker Decl. (C), ¶10. Moreover, a careful reading of the complete disclosure of Ohno makes clear that simply covering the wall surface of the exhaust gas cell walls with a thick uniform catalyst coating layer using a washcoating technique, *without any permeation through the pores*, will result in the pores being clogged, and thus an undesirable increase in back pressure. *See* Ohno, p. 12, l. 27 to p. 13, l. 6 (emphasis added). As Dr. Walker explains, Ohno, in fact, teaches that washcoats should be applied to wall flow monoliths in a manner that distributes the washcoat composition through the wall surface and into network of pores, thereby preventing pressure loss due to the catalyst clogging pores and improving the durability, *i.e.* reducing or eliminating peeling of the coating on the wall surfaces. Walker Decl. (C), ¶12, citing Ohno, p. 13, ll. 2-17. Just as the ‘597 Patent, the goal of Ohno is to avoid a thick washcoat deposited using a washcoating technique on the wall surface of the wall flow filter so as to avoid clogging the pores. *Id.* As stated at page 13, lines 10-13 of Ohno, “[t]herefore, in the embodiment of the invention, the pores of the cell walls 12 themselves are maintained as pores; in other words, the gaps between each of the SiC particles 4 are never completely clogged. Due to this, compared to the conventional catalyst coating layer 2, the pressure loss can be notably less.” The comparative example of Ohno actually is very similar to the ‘597 Patent’s comparative example. The ‘597 Patent shows, just as Ohno showed, by comparative example, Catalyst B1, which was loaded with 2.0 g/in<sup>3</sup> (which falls within the scope of claim 1)<sup>4</sup> that when you load the filter in a

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<sup>4</sup> The Patent Owner remains silent as to how a wall flow filter having a coating applied to only one side of the wall of the filter would be operative in view of its comparative example.

manner that clogs the pores, *i.e.*, by placing a thick body of a washcoat on the walls of the filter, not unexpectedly, the resulting filter suffers from an unacceptable back pressure. '597 Patent, col. 12, l. 22 to col. 13, l. 32. Thus, Ohno does not teach away from the claims of the '597 Patent, but in fact teaches the very same concept as the '597 Patent, *i.e.*, washcoating compositions that result in a thick pore clogging coating should be avoided by applying a washcoating composition that permeates throughout the pores of a relatively high porosity filter.

## 2. Schafer-Sindlinger and Ohno are Combinable

At pages 13-14 of the Amendment, the Patent Owner argues that Schafer-Sindlinger teaches a catalyst loading that would destroy the purpose of Ohno, as the Patent Owner argues that Schafer-Sindlinger teaches catalyst loadings that are much higher than those that would be permitted by Ohno. The Patent Owner's argument, however, fails to consider the collective teachings of the references, and does not address the actual reasoning of the rejection set forth in the Office Action.

As discussed above, Ohno teaches that washcoats should be applied to wall flow monoliths in a manner that distributes the washcoat composition through the wall surface and into network of pores, thereby preventing pressure loss due to the catalyst clogging pores. Walker Decl. (C), ¶12, citing Ohno, p. 13, ll. 2-17. Thus, as correctly found in the Office Action, Ohno teaches providing catalyst in a manner that provides for minimal loss of exhaust pressure. Office Action, pp. 5-6. It follows that when combining the wall flow filter of Ohno with the system of Schafer-Sindlinger, one of ordinary skill in the art would have utilized the guidance provided by Ohno in applying SCR catalyst to the wall flow filter. Blakeman Decl. (A), ¶9.

Notwithstanding that Ohno would have been understood by one of ordinary skill in the art to teach the technique for applying SCR catalyst to a wall flow filter, the Patent Owner is incorrect in asserting that the catalyst loadings taught by Schafer-Sindlinger run contrary to the teaching of Ohno. Schafer-Sindlinger teaches that "[a] coating concentration of *up to* 200 grams of catalyst powder per liter [3.3 g/in<sup>3</sup>] of honeycomb structure is preferably striven for." Schafer-Sindlinger, paragraph [0024] (emphasis added).<sup>5</sup> Schafer-Sindlinger does not indicate

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<sup>5</sup> The Patent Owner and Dr. Haller have apparently misread the teaching of Schafer-Sindlinger with respect to the coating concentration. Both assert that Schafer-Sindlinger "requires loadings *equal to or greater* than 200 g/l (3.28 g/in<sup>3</sup>)." Amendment, p. 14, Haller Decl., ¶21 (emphasis added). This is not true. At no point does Schafer-Sindlinger require a coating concentration of greater than 200 g/L.

any particular required catalyst loading, and indeed, the cited passage merely suggests a maximum catalyst concentration that would be needed in the system.<sup>6</sup> Further, as explained by Dr. Blakeman, one of ordinary skill would have understood the referenced coating concentration to indicate that the coating concentration could be tailored to the particular configuration of the substrate, *i.e.*, providing a coating concentration at a level suitable for a wall flow monolith as opposed to a coating concentration at a level suitable for a flow through substrate. Blakeman Decl. (A), ¶9. Moreover, Ohno is cited in the rejection for providing guidance for applying the catalyst coating composition to avoid the problem of pressure loss due to pore clogging, which one of ordinary skill in the art would have also considered in conjunction with the disclosure of Schafer-Sindlinger regarding coating concentration. Blakeman Decl. (A), ¶9.

Therefore, the combination of Schafer-Sindlinger and Ohno collectively teaches providing SCR washcoating catalyst compositions to a wall flow monolith, and Ohno provides guidance for applying the washcoat to avoid pressure loss. One of ordinary skill in the art would have looked to provide the SCR washcoat catalyst compositions of Schafer-Sindlinger, such as metal exchanged zeolites, to a wall flow monolith, as well as the guidance in Ohno for applying the washcoat catalyst composition to the a wall flow monolith. Blakeman Decl. (A) ¶9. As such, the wall flow monolith of Ohno would not have been rendered unsatisfactory for its intended purpose when combined with the system disclosed by Shafer-Sindlinger. *Id.* Thus, the Office Action correctly concludes that one of ordinary skill in the art would have “utilized the wall flow monolith taught by Ohno as the filter substrate of Schafer-Sindlinger, wherein Schafer-Sindlinger’s [SCR] catalyst is added between the pores of the wall flow monolith in the manner taught by Ohno in order to provide an SCR filter having minimal loss of exhaust pressure.” Office Action, p. 6.<sup>7</sup>

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<sup>6</sup> Dr. Haller refers to a “high enough loading to maintain activity after aging required in Schafer-Sindlinger.” Haller Decl., ¶20. Dr. Haller does not, however, indicate catalyst loading that Schafer-Sindlinger requires to maintain activity. Nor does Dr. Haller cite to any disclosure in Schafer-Sindlinger in making this assertion.

<sup>7</sup> The Office Action also finds in another ground of rejection that the amount of SCR catalyst is a result effective variable that would have been obvious to optimize. Office Action, p. 13. Clearly the SCR catalyst would have been a result effective variable in the combination of Schafer-Sindlinger and Ohno as well. See Request, pp. 13-16.

3. Schafer-Sindlinger and Ohno Teach and Suggest a Wall Flow Monolith

At pages 14-16 of the Amendment, the Patent Owner asserts that Schafer-Sindlinger's reference to a "conventional honeycomb structure" would have been understood by a person of ordinary skill in the art to be a flow through substrate, not a wall flow monolith. This assertion is not consistent with how one of ordinary skill in the art would understand the reference.

Schafer-Sindlinger does not expressly limit that the "conventional honeycomb structure" to a flow through substrate, and one of ordinary skill in the art would not have understood the reference to be so limited. Instead, as opined by Dr. Blakeman, one of ordinary skill in the art would have understood the reference to a "conventional honeycomb structure" in Schafer-Sindlinger to include a wall flow filter. Blakeman Decl. (A), ¶7. Indeed, the term "honeycomb structure" is clearly established in the art to encompass wall flow monoliths. *Id.*, see also Ohno, p. 1, ll. 13-16; Nakanishi, para. (0005). In fact, the '597 Patent itself discusses "*honeycomb* wall flow filters" and even claims a "*honeycomb* flow through monolith." '597 Patent, col. 1, l. 66 - col. 2, l. 4; col. 3, ll. 58-63; claim 11. Moreover, the references in paragraph [0024] of Schafer-Sindlinger to a coating concentration of "up to 200 grams of catalyst powder per liter" would have been understood by one of ordinary skill in the art to indicate that the coating concentration could be tailored to the particular configuration of the substrate, *i.e.*, providing a coating concentration at a level suitable for a wall flow monolith as opposed to a coating concentration at a level suitable for a flow through substrate. Blakeman Decl. (A), ¶7.

The Patent Owner's argument also fails to consider the collective teaching in the combination of Schafer-Sindlinger and Ohno. To the extent that Schafer-Sindlinger does not expressly specify a wall flow monolith, Ohno clearly does disclose such a structure. One cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co., Inc.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). Along these lines, the Patent Owner does not assert that a wall flow monolith provided with SCR catalyst could not be used to reduce NO<sub>x</sub> in the system of Schafer-Sindlinger.

4. **Schafer-Sindlinger Does Not Require a Different Order of System Components than that Claimed in the '597 Patent**

At pages 11 and 16 of the Amendment, the Patent Owner argues that Schafer-Sindlinger was meant to be an improvement upon the system WO 99/38909, and thus, Schafer-Sindlinger requires an order of components set forth in WO 99/38909 wherein a particulate filter is placed upstream of a source of reductant fluid and a SCR catalyst. This argument is nonsensical at best. First, WO 99/38909 does not in anyway dictate the order of the components disclosed by Schafer-Sindlinger.<sup>8</sup>

Moreover, one of ordinary skill in the art would have readily understood (as made clear by Schafer-Sindlinger at para. [0035]) that when the wall flow monolith with SCR catalyst taught by Ohno was incorporated in the system of the Schafer-Sindlinger, the wall flow monolith with SCR catalyst, whose very purpose is to catalyze the reduction of NOx, should be placed downstream of the reductant source.

5. **Claim 2**

At page 16 of the Amendment, the Patent Owner refers to their previous arguments regarding Ohno teaching away from using washcoats on a wall flow monolith with high porosity and larger pores. As discussed in Section III.A.1 above, however, Ohno in fact, teaches that washcoating compositions that result in a thick pore clogging coating should be avoided by applying a washcoating composition that permeates throughout the pores of a relatively high porosity filter. Thus, Ohno does not teach away from the application of washcoats to a wall flow monolith with high porosity and larger pores.

6. **Claims 3 and 4**

At page 16 of the Amendment, the Patent Owner argues that there is nothing in the combination of Schafer-Sindlinger and Ohno that teaches or suggests the zeolite with a base metal of copper recited in claims 3 and 4 being applied as a washcoating composition to the walls of a wall flow monolith to promote SCR of NOx.

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<sup>8</sup> The only disclosure of WO 99/38909 that Schafer-Sindlinger actually references is the use of V<sub>2</sub>O<sub>5</sub>/WO<sub>3</sub>/TiO<sub>2</sub> catalyst. Schafer-Sindlinger, paragraph [0007]. And along these lines, Schafer-Sindlinger indicates that its invention is an improvement in that a V<sub>2</sub>O<sub>5</sub>/WO<sub>3</sub>/TiO<sub>2</sub> catalyst is not used. *Id.* at paragraph [0011].

As correctly found in the Office Action, however, Schafer-Sindlinger teaches an SCR catalyst that is a zeolite with a base metal of copper. Office Action, p. 6. Further, as described above, the combination of Schafer-Sindlinger and Ohno renders obvious the application of such SCR catalysts to a wall flow monolith.

At page 16, the Patent Owner also refers to the claimed SCR catalyst as promoting the burning of soot. Claims 3 and 4, however, do not recite that the SCR catalysts function to promote the burning of soot.

**7. Claim 5**

At page 17 of the Amendment, the Patent Owner argues that there is nothing in the combination of Schafer-Sindlinger and Ohno that teaches or suggests the zeolite with the specifically recited alumina ratio recited in claim 5 being applied as a washcoating composition to the walls of a wall flow monolith to promote SCR of NOx.

As correctly found in the Office Action, however, Schafer-Sindlinger teaches the claimed zeolite with a silica to alumina ratio of at least about 10. Office Action, p. 6. Further, as described above, the combination of Schafer-Sindlinger and Ohno renders obvious the application of such an SCR catalyst to a wall flow monolith.

At page 17, the Patent Owner also refers to the claimed zeolite as providing SCR conversion together with promoting the burning of soot. Claim 5, however, does not recite that the zeolite promotes the burning of soot.

**8. Claim 6**

At page 17 of the Amendment, the Patent Owner argues that there is nothing in the combination of Schafer-Sindlinger and Ohno that teaches or suggests a beta zeolite being applied as a washcoating composition to the walls of a wall flow monolith to promote SCR of NOx.

As correctly found in the Office Action, however, Schafer-Sindlinger teaches the claimed beta zeolite. Office Action, p. 6. Further, as described above, the combination of Schafer-Sindlinger and Ohno renders obvious the application of such an SCR catalyst to a wall flow monolith.

At page 17, the Patent Owner also refers to the claimed beta zeolite as providing SCR conversion together with promoting the burning of soot. Claim 6 however, does not recite that the beta zeolite promotes the burning of soot.



## 9. Claim 7

At page 17 of the Amendment, the Patent Owner asserts that there is nothing in Ohno or Schafer-Sindlinger that teaches or suggests the specific washcoat loadings recited in the claim. As discussed in Section III.A.1, Ohno discloses a washcoat. In addition, the catalytic material contained in the wall flow monolith need not be all washcoat, *i.e.*, a coating of an SCR catalyst composition as the term “comprising” follows catalytic material in the claims of the ‘597 Patent. Moreover, as explained by the Examiner in the rejection set forth in Ground 9, the amount of SCR catalyst on the wall surface and in the pores is simply a results effective variable and there has been no criticality shown regarding the claimed loadings, *i.e.*, there has been no showing, for example, that a loading of 1.6 g/in<sup>3</sup> provides unexpectedly surprising properties over a loading outside the claimed range.

In his Declaration, Dr. Phillips, who has a significant amount of expertise in the use of catalytic filters for automotive applications, clearly evidences the expected effect of the claimed catalyst loading on back pressure and NOx conversion. The Phillips Declaration (B) tests a wall flow substrate with a washcoating composition of an SCR catalyst at a target loading of 1.3 g/in<sup>3</sup> that is applied using the procedure exemplified in the broadest claims of the ‘597 patent. Phillips Decl. (B), ¶6. The %NOx conversion was measured as function of washcoat loading. *Id.* at ¶9. Dr. Phillips found that NOx conversion increases smoothly with increasing washcoat loading (Exhibit B-2) and there is no unexpected increase in activity at above about 1.3 g/in<sup>3</sup>, and even above about 1.6 g/in<sup>3</sup>. *See id.* The backpressure was also measured as a function of washcoat loading. *Id.* at ¶11. Dr. Phillips found that the backpressure increases smoothly with increasing washcoat loading (Exhibit B-3) and there is no unexpected decrease in the rate of increase of backpressure relative to washcoat loading at above about 1.3 g/in<sup>3</sup>, and even above about 1.6 g/in<sup>3</sup>. *See id.* Thus, Dr. Phillips concludes that for the samples tested, increasing the loading of catalyst composition in the range of loadings tested demonstrated the expected effect that the NOx conversion was improved, but also that backpressure increased and that neither trend is in any way surprising. *Id.* at ¶12. Based on his years of experience in the field, Dr. Phillips further opines that he would expect similar trends using other substrates, catalysts, and preparation and loading methods, though of course the absolute results would be likely to vary significantly depending on the choices of substrates, catalysts and preparation and loading methods that were used. *Id.*

In addition, the '597 Patent also makes clear that the loading of the slurry into the appropriately selected filter is nothing more than a results effective parameter. *See* col. 10, ll. 27-29 (“As will be apparent to those of skill in the art, the catalyst loading can be modified by altering the solids content of the coating slurry.”). Moreover, the prior art makes it clear that a person of ordinary skill would have had an expectation that high washcoat loadings could be made on a relatively high porosity wall flow filter, such as disclosed in Ohno, without a detrimental loss in back pressure. *See* Hashimoto, col. containing Figure 21, which discloses that a washcoat of 100 g/l (1.64 g/in<sup>3</sup>) on a wall flow filter having a porosity of 59% and a mean pore size of 25 μm had a favorable low pressure drop. In fact, quite significantly, Hashimoto provides for this expectation through washcoating what appears to be the same filter (DHC-611) employed in the examples of the '597 Patent. There was simply nothing unexpected about the catalyst loadings set forth in the claims of the '597 Patent.

The Patent Owner also asserts that nothing in Ohno would suggest a wall flow filter that could promote SCR reduction of NO<sub>x</sub> at 600 °C and below and would lower the soot burning temperature with SCR catalyst. Claim 7, however, does not recite claim features that define and delimit a wall flow filter that could promote SCR reduction of NO<sub>x</sub> at 600 °C and below and would lower the soot burning temperature with SCR catalyst. The claim is far broader than that and clearly has not been shown to be commensurate in scope with any advantages alleged by the Patent Owner. Thus, the Patent Owner's arguments are not relevant to the invention as claimed.

**B. Ground 2 - Rejection of Claim 9 as being obvious over Schafer-Sindlinger in view of Ohno and International Publication No. WO 01/96717 (Chapman)**

At page 18 of the Amendment, the Patent Owner argues that Chapman “does nothing to remedy the deficiency of the combined teaches of Ohno and Schafer-Sindlinger, which is to avoid the application of washcoats to wall flow monoliths.” The Patent Owner also argues that Chapman teaches that the walls of a flow through honeycomb should be rendered gas impermeable by the application of a catalyst washcoat, and that Chapman and Ohno therefore conflict. The Patent Owner's arguments are incorrect, however, for multiple reasons.

Chapman is correctly relied upon in the adopted rejection for teaching that an oxidation catalyst can be provided on a flow through honeycomb monolith, with the washcoat including a high surface area oxide carrier substrate such as a zeolite. Office Action, p. 7. Thus, nothing in this disclosure of Chapman conflicts with the downstream wall flow monolith provided with

SCR catalyst that is taught and suggested by the combination of Schafer-Sindlinger and Ohno. Further, as described in Section III.A above, there is no “deficiency” of Ohno and Schafer-Sindlinger, as the references do not in fact teach away from the application of washcoating composition to wall flow monoliths.

C. **Ground 9- Rejection of Claims 1-8, 10, and 12-15 as being obvious over Ohno in view of U.S. Patent No. 5,516,497 (Speronello) and U.S. Patent No. 6,928,806 (Tennison)**

1. **Ohno Teaches a Catalytic Washcoat that Permeates the Walls of a Wall Flow Filter**

At pages 20-21 of the Amendment, the Patent Owner asserts that Ohno teaches away from application of washcoats to wall flow monoliths. As discussed in Section III.A.1 above, however, Ohno does not teach away from the claims of the ‘597 Patent, but in fact teaches the very same concept as the ‘597 Patent, *i.e.*, washcoating compositions that result in a thick pore clogging coating should be avoided by applying a washcoating composition that permeates throughout the pores of a relatively high porosity filter.

2. **Attacking References Individually**

At pages 19-21 of the Amendment, the Patent Owner rebuts the applied references individually, rather than addressing what is taught by the combination of Ohno, Speronello, and Tennison. For instance, the Patent Owner argues that Speronello is limited to applying the catalysts to honeycomb flow through substrates and packed beds, and that there is no disclosure of application of SCR catalyst compositions to wall flow monoliths. However, it is clear that Speronello discloses metal (*e.g.* iron or copper)-promoted zeolite catalyst and the use of such a catalyst in the selective catalytic reduction of nitrogen oxides with ammonia. Speronello, col. 2, ll. 60-66, abstract. While the catalyst is preferably applied to a monolithic honeycomb type body (col. 7, ll. 38-41), the Examiner relied on Speronello for simply teaching advantageous SCR catalysts for NO<sub>x</sub> reduction of diesel exhaust with an ammonia reductant. Office Action, pp. 12-13.

The Patent Owner, relying on the Haller Declaration, also asserts at pages 20 and 21 of the Amendment that the application of washcoat to flow through substrates has no relevance to the application of a washcoat to a wall flow monolith as the substrates allegedly have different porosity considerations with respect to back pressure because all of the channels in a flow

through monolith are open, whereas they are plugged on one end in a wall flow monolith. However, as noted above, the Examiner relied on Speronello for simply teaching advantageous SCR catalysts for NO<sub>x</sub> reduction of diesel exhaust with an ammonia reductant. Office Action, pp. 13-14. Moreover, as opined by Dr. Walker, a person of ordinary skill in the art looking to load an SCR catalyst on a wall flow filter would look to SCR catalysts used in any filter, even if the catalyst was used on a flow through substrate, such as in Speronello. Walker Decl. (C), ¶9.

Regarding the Patent Owner's assertion that one of ordinary skill in the art would not consult Speronello for information pertaining to loading amounts of washcoats to apply to a wall flow monolith in Ohno, it should be noted that the Examiner has relied upon the various loadings in Speronello just to emphasize that the amount of catalyst loading is a results effective variable. Office Action, p. 13.

Additionally, it is well established that it is improper to attack references individually where the rejection is based on a combination. *In re Keller*, 642 F.2d 413, 425 (C.C.P.A. 1981); MPEP § 2145(IV). Accordingly, arguing that Speronello does not teach the claimed application of SCR catalyst compositions to wall flow monoliths is irrelevant and improper where their combination does teach that feature.

### 3. Tennison Teaches an Oxidation Catalyst and Reductant Injector

At page 21 of the Amendment, the Patent Owner argues that the proposed combination of Ohno in view Speronello and Tennison would require a redesign and reconfiguration of the system of Tennison. The Patent Owner's argument, however, fails to address the rejection and how the combined teachings of the cited references render obvious the claimed system.

As set forth in the rejection at pages 16-17 of the Office Action, the combined teachings of Ohno and Speronello provide for an ammonia SCR catalyst on a wall flow monolith having the claimed porosity, pore size, and SCR concentration. Tennison is cited in the rejection for teaching the obviousness of providing an oxidation catalyst and ammonia injector upstream of the wall flow monolith suggested by Ohno and Speronello. Office Action, pp. 13-14. In other words, Tennison is merely cited as a secondary reference teaching additional features that would have been obvious to include with the combination of Ohno and Speronello. Indeed, the Haller Declaration acknowledges Tennison "is merely relied upon for teaching a system that includes an oxidation catalyst upstream of reductant injector, which is upstream of an SCR catalyst." Haller Decl., ¶24. With the formulation of the rejection in mind, it is readily apparent that the

Patent Owner's arguments regarding the redesign and reconfiguration of the system of Tennison are irrelevant, and fail to address the question of whether it would have been obvious to combine the specific components taught by Tennison with the wall flow monolith suggested by Ohno as Speronello. It would have been obvious to one of ordinary skill in the art to have provided upstream of the wall flow monolith suggested by Ohno and Speronello the additional system components of an oxidation catalyst and a reductant injector like those taught by Tennison, and in so doing, one of ordinary skill in the art would not have needed to reconfigure or redesign the system of Tennison.

Additionally, it should be noted that that it is improper to attack references individually where the rejection is based on a combination. *In re Keller*, 642 F.2d 413, 425 (C.C.P.A. 1981); MPEP § 2145(IV). The Patent Owner's arguments with respect to the redesign and reconfiguration of Tennison amount to such an improper attack on a reference individually, where the rejection is actually based on a combination of references.

4. **Claim 2**

At page 22 of the Amendment, the Patent Owner refers to their previous arguments regarding Ohno teaching away from using washcoats on a wall flow monolith with high porosity and larger pores. As discussed in Section III.C.1 above, however, Ohno does not teach away from the application of washcoats to a wall flow monolith with high porosity and larger pores, and in fact, teaches that washcoating compositions that result in a thick pore clogging coating should be avoided by applying a washcoating composition that permeates throughout the pores of a relatively high porosity filter.

5. **Claims 3 and 4**

At page 22 of the Amendment, the Patent Owner argues that there is nothing in the combination of Ohno, Speronello, and Tennison that teaches the zeolite with a base metal of copper recited in claims 3 and 4 applied as a washcoating composition to the walls of a wall flow monolith to promote SCR of NO<sub>x</sub>.

As correctly found in the Office Action, however, Speronello teaches an SCR catalyst that is a zeolite with a base metal of copper. Office Action, p. 14. Further, as described above, the combination of Ohno, Speronello, and Tennison renders obvious the application of such SCR catalysts to a wall flow monolith.

At page 22, the Patent Owner also refers to the claimed SCR catalyst as promoting the burning of soot. Claims 3 and 4, however, do not recite that the SCR catalysts function to promote the burning of soot.

**6. Claim 5**

At pages 22-23 of the Amendment, the Patent Owner argues that there is nothing in the combination of Ohno, Speronello, and Tennison that teaches the zeolite with the specifically recited alumina ratio recited in claim 5 being applied as a washcoating composition to the walls of a wall flow monolith to promote SCR of NOx.

As correctly found in the Office Action, however, Speronello teaches the claimed zeolite with a silica to alumina ratio of at least about 10. Office Action, p. 15. Further, as described above, the combination of Ohno, Speronello, and Tennison renders obvious the application of such an SCR catalyst to a wall flow monolith.

At page 23, the Patent Owner also refers to the claimed zeolite as providing SCR conversion together with promoting the burning of soot. Claim 5, however, does not recite that the zeolite promotes the burning of soot.

**7. Claim 6**

At page 23 of the Amendment, the Patent Owner argues that there is nothing in the combination of Ohno, Speronello, and Tennison that teaches a beta zeolite being applied as a washcoating composition to the walls of a wall flow monolith to promote SCR of NOx.

As correctly found in the Office Action, however, Speronello teaches the claimed beta zeolite. Office Action, p. 15. Further, as described above, the combination of Ohno, Speronello, and Tennison renders obvious the application of such an SCR catalyst to a wall flow monolith.

At page 23, the Patent Owner also refers to the claimed beta zeolite as providing SCR conversion together with promoting the burning of soot. Claim 6 however, does not recite that the beta zeolite promotes the burning of soot.

**8. Claim 7**

At page 23 of the Amendment, the Patent Owner asserts that there is nothing in Ohno, Speronello, and Tennison that teaches or suggests the specific washcoat loadings recited in this claim. As discussed in Section III.C.1, Ohno discloses a washcoat. In addition, the catalytic material contained in the wall flow monolith need not be all washcoat, *i.e.*, a coating of an SCR

catalyst composition as the term “comprising” follows catalytic material in the claims of the ‘597 Patent. Moreover, as explained by the Examiner in the rejection set forth in Ground 9, the amount of SCR catalyst on the wall surface and in the pores is simply a results effective variable and there has been no criticality shown regarding the claimed loadings, *i.e.*, there has been no showing, for example, that a loading of 1.6 g/in<sup>3</sup> provides unexpectedly surprising properties over a loading outside the claimed range.

In his Declaration, Dr. Phillips, who has a significant amount of expertise in the use of catalytic filters for automotive applications, clearly evidences the expected effect of the claimed catalyst loading on back pressure and NOx conversion. The Phillips Declaration (B) tests a wall flow substrate with a washcoating composition of an SCR catalyst at a target loading of 1.3 g/in<sup>3</sup> that is applied using the procedure exemplified in the broadest claims of the ‘597 patent. Phillips Decl. (B), ¶6. The %NOx conversion was measured as function of washcoat loading. *Id.* at ¶9. Dr. Phillips found that NOx conversion increases smoothly with increasing washcoat loading (Exhibit B-2) and there is no unexpected increase in activity at above about 1.3 g/in<sup>3</sup>, and even above about 1.6 g/in<sup>3</sup>. *See id.* The backpressure was also measured as function of washcoat loading. *Id.* at ¶11. Dr. Phillips found that the backpressure increases smoothly with increasing washcoat loading (Exhibit B-3) and there is no unexpected decrease in the rate of increase of backpressure relative to washcoat loading at above about 1.3 g/in<sup>3</sup>, and even above about 1.6 g/in<sup>3</sup>. *See id.* Thus, Dr. Phillips concludes that for the samples tested, increasing the loading of catalyst composition in the range of loadings tested demonstrated the expected effect that the NOx conversion was improved, but also that backpressure increased and that neither trend is in any way surprising. *Id.* at ¶12. Based on his years of experience in the field, Dr. Phillips further opines that he would expect similar trends using other substrates, catalysts, and preparation and loading methods, though of course the absolute results would be likely to vary significantly depending on the choices of substrates, catalysts and preparation and loading methods that were used. *Id.*

In addition, the ‘597 Patent also makes clear that the loading of the slurry into the appropriately selected filter is nothing more than a results effective parameter. *See* col. 10, ll. 27-29 (“As will be apparent to those of skill in the art, the catalyst loading can be modified by altering the solids content of the coating slurry.”). Moreover, the prior art makes it clear that a person of ordinary skill would have had an expectation that high washcoat loadings could be

made on a relatively high porosity wall flow filter, such as disclosed in Ohno, without a detrimental loss in back pressure. *See* Hashimoto, col. containing Figure 21, which discloses that a washcoat of 100 g/l (1.64 g/in<sup>3</sup>) on a wall flow filter having a porosity of 59% and a mean pore size of 25 μm had a favorable low pressure drop. In fact, quite significantly, Hashimoto provides for this expectation through washcoating what appears to be the same filter (DHC-611) employed in the examples of the '597 Patent. There was simply nothing unexpected about the catalyst loadings set forth in the claims of the '597 Patent.

The Patent Owner also asserts that nothing in Ohno would suggest a wall flow filter that could promote SCR reduction of NO<sub>x</sub> at 600 °C and below and would lower the soot burning temperature with SCR catalyst. Claim 7, however, does not recite claim features that define and delimit a wall flow filter that could promote SCR reduction of NO<sub>x</sub> at 600 °C and below and would lower the soot burning temperature with SCR catalyst. The claim is far broader than that and clearly has not been shown to be commensurate in scope with any advantages alleged by the Patent Owner. Thus, the Patent Owner's arguments are not relevant to the invention as claimed.

**D. Ground 10- Rejection of Claim 9 as being obvious over Ohno in view of Speronello, Tennison, and Chapman**

At pages 23-24 of the Amendment, the Patent Owner refers to their previous arguments with respect to Chapman, and asserts that Chapman does not "remedy the deficiencies" in the combination of Ohno in view of Speronello and Tennison. At page 24, the Patent Owner also reiterates their arguments that Ohno and Tennison teach away from the claimed invention.

As described in Section III.C above, however, the combination of Ohno, Speronello, and Tennison teach the broadly claimed emission treatment system, and nothing in the references teaches away from the claimed invention. Moreover, Chapman is merely relied upon in the adopted rejection for teaching an oxidation catalyst can be provided on a flow through honeycomb monolith, with the washcoat including a high surface area oxide carrier substrate such as a zeolite. As correctly found in the Office Action, it would have been obvious to combine the teaching of Chapman with the other cited references. Office Action, pp. 16-17.



IV. **Proposed New Grounds of Rejection of Claims 1-15 Based on Hashimoto, S. et al., “SiC and Cordierite Diesel Particulate Filters Designed for Low Pressure Drop and Catalyzed, Uncatalyzed Systems,” SAE Technical Paper Series, 2002-01-0322 (Mar. 2002) (Hashimoto)**

Hashimoto, which for the first time became known to Requester after the filing of the subject request for *inter partes* reexamination proceeding, is submitted under 37 C.F.R. § 1.948(a)(3). Requester did not know of Hashimoto on the September 7, 2011 filing date of the Request for *Inter Partes* Reexamination. Requester became aware of Hashimoto as a result of a prior art search in preparation for a European opposition against a patent not related to the ‘597 Patent. The prior art search was conducted on December 6, 2011. The search identified the Hashimoto reference by title. Requester requested a copy of the Hashimoto reference from the Society of Automotive Engineers (SAE), and received the paper on or about December 12, 2011. Therefore, as the Requester was not previously aware of Hashimoto, the reference can now be submitted under 37 C.F.R. § 1.948(a)(3).

A. **Proposed New Ground of Rejection of Claims 1-8 and 10-15 as Being Obvious Over Hashimoto in View of WO 02/26351 (Ohno) and U.S. Patent Application Pub. No. 2002/0039550 (Schafer-Sindlinger)**

This combination is non-cumulative for at least the reason that it discloses a catalyst coating that permeates the walls of a wall flow filter not previously considered during prosecution. Hashimoto and Ohno also independently disclose that their catalyst coated wall flow filters keep the pressure loss of the exhaust low when the amount of the catalyst on the filter is increased, which results in the combination rendering obvious the claimed features of SCR catalyst applied to a wall flow monolith. The Applicants argued that such features were not taught by the prior art during prosecution of Patent Application No. 10/634,659 (“the ‘659 Application”) that led to the ‘597 Patent, and the Examiner cited such features as not being disclosed or suggested by the prior art in the reasons for allowance of the ‘659 Application. See ‘659 Application, November 27, 2006 Amendment, p. 6; December 28, 2006 Notice of Allowability, p. 2. In fact, Dr. Blakeman makes clear that high porosity wall flow monoliths, such as disclosed in Hashimoto, were specifically developed for supporting catalysts in exhaust systems. Blakeman Decl. (A), ¶10. Thus, this combination provides a new, non-cumulative teaching that was not previously considered during the prosecution of the ‘597 Patent.

Hashimoto discloses a catalyzed diesel particulate filter (DPF), inside whose pores a washcoat containing catalyst for soot oxidation is applied. Paragraph below Figure 20. Hashimoto also suggests the use of a NO<sub>x</sub> adsorption catalyst with relatively high porosity filter. *Id.* The filter of Hashimoto appears to be the same filter (DHC-611) employed in the examples of the '597 Patent. *Id.* at Table 3. It meets all the elements related to the wall flow monolith in claimed system. The high porosity washcoat catalyzed wall flow filter of Hashimoto is essentially made of a wall flow filter with a washcoat of a catalyst and would not materially alter the nature of the claimed catalyst article. Paragraph below Figure 20. Hashimoto also discloses that a washcoat of 100 g/l (1.64 g/in<sup>3</sup>) on a wall flow filter having a porosity of 59% and a mean pore size of 25 μm had a favorable low pressure drop. *Id.*, col. containing Figure 20, Table 3. Hashimoto makes clear that high porosity material can be coated with significantly higher washcoat loading without adversely effecting pressure-drop. *Id.*

Ohno discloses a catalyst holding filter capable of efficiently conducting oxidation removal of carbon monoxide and hydrocarbon and reduction of nitrogen oxide (NO<sub>x</sub>) included in an exhaust gas. *See, e.g.*, Ohno, p. 1, ll. 7-9. The pores in the cell walls of the wall flow monolith of Ohno are covered by a catalyst coat layer. P. 7, ll. 3-8 and Figs. 1-3. The application of a platinum catalyst is exemplified. P. 34, ll. 11-13. Ohno makes clear that the catalyst can be an SCR catalyst or an occlusion catalyst to deoxidize NO<sub>x</sub>.<sup>9</sup> P. 28, ll. 13-15.

Regarding the meaning of the claim term "permeates", the '597 Patent at col. 10, ll. 21-22 states that permeate "means that the catalyst composition is dispersed throughout the wall of the substrate." To say that the catalytic material is "dispersed throughout the wall of the substrate" (emphasis added) must mean that the catalytic material is dispersed throughout the wall surface and the network of pores of the filter that extend from one side of the filter walls to the other side of the filter walls. Request, p. 12. The Patent Owner has not disagreed.

Regarding the concentration of SCR catalyst being at least 1.3 g/in<sup>3</sup>, Hashimoto discloses a wall flow filter with a washcoat loading of 100 g/l (1.64 g/in<sup>3</sup>). *See, e.g.*, col. containing Figure 20. It follows that it would have been obvious to load the SCR catalyst of Ohno onto the wall flow filter of Hashimoto with a washcoat loading of 100 g/l (1.64 g/in<sup>3</sup>).

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<sup>9</sup> The terms "occlusion catalyst," "NO<sub>x</sub> absorber," and "NO<sub>x</sub> trap" were used interchangeably in the art. *See, e.g.*, U.S. Patent Application Pub. No. 2002/0108367 (Surnillia), paragraphs [0003],[0007],[0010].

Thus, the combination of Hashimoto and Ohno teaches and suggests the wall flow monolith comprising an SCR catalyst as recited in claim 1. Ohno further contemplates the use of its NOx reduction technology as part of a system for treatment of exhaust from an engine, and Hashimoto suggests the use of its wall flow monolith in such a system by noting that catalyzed configurations of the wall flow monolith could include NOx adsorption catalyst. Ohno, p. 1, ll. 6-10; Hashimoto, col. containing Figure 20. As evidenced by Schafer-Sindlinger, the other features of the exhaust treatment system recited in claim 1 were known in the art, and would have been readily included with the wall flow monolith having SCR catalyst that is taught and suggested by Hashimoto and Ohno.

Schafer-Sindlinger discloses a system for treatment of an exhaust stream comprising oxides of nitrogen. *See, e.g.*, para. [0001]. The system of Schafer-Sindlinger includes an oxidation catalyst for forming or increasing the nitrogen dioxide content in the exhaust gas stream. Figure 1; para. [0015]. The system further comprises an injector in fluid communication with and downstream of the oxidation catalyst, with the injector providing ammonia or an ammonia precursor (urea) into the exhaust stream. Para. [0035].

Regarding the claim term “periodically meters”, the ‘597 Patent does not provide an express definition for the term. The ‘597 Patent, however, cites U.S. Patent No. 4,963,332 (Brand) as disclosing an exemplary dosing system for injecting NOx reductant into an exhaust stream. ‘597 Patent, col. 10, ll. 34-38. The system of Brand monitors the nitrogen oxide content of an exhaust stream and injects a reducing agent into the exhaust stream so as to achieve a stoichiometric ratio of reducing agent to nitrogen oxide. Col. 1, ll. 51-64; col. 2, ll. 25-45. Thus, the ‘597 Patent indicates that an interpretation of the claimed periodic metering of ammonia or ammonia precursor is providing the ammonia or ammonia precursor so as to achieve a specific ratio with the NOx in the exhaust stream. The injector of Schafer-Sindlinger injects the ammonia or ammonia precursor such that a specific molar ratio of NH<sub>3</sub>/NOx is achieved. Para. [0035]. Thus, the injector of Schafer-Sindlinger “periodically meters” ammonia or an ammonia precursor as that term is used in the ‘597 Patent. The Patent owner has not disagreed.

The emission treatment system of Schafer-Sindlinger further comprises an SCR catalyst downstream of the injector for reducing the nitrogen dioxide with the injected ammonia or ammonia precursor. *See* paras. [0019]-[0020]. The SCR catalyst is in the form of a metal (e.g., iron or copper)-promoted zeolite catalyst. Para. [0014]. Schafer-Sindlinger indicates that the

zeolite catalyst is “preferably applied, in the form of coating, to honeycomb structures made of ceramic or metal . . . A coating concentration of up to 200 grams of catalyst powder per liter [3.3 g/in<sup>3</sup>] of honeycomb structure is preferably striven for.” Para. [0024]. In a specific example, Schafer-Sindlinger uses a “conventional honeycomb structure” made of cordierite to support the zeolite catalyst. Para. [0038]. One of ordinary skill in the art would have understood the conventional honeycomb structure to include a wall flow monolith. Blakeman Decl. (A), ¶7.

Thus, it would have been obvious to one of ordinary skill in the art to have provided an exhaust treatment system with an oxidation catalyst and ammonia injector, as taught by Schafer-Sindlinger, upstream of the wall flow monolith comprising SCR catalyst suggested by Hashimoto, Ohno, and Schafer-Sindlinger. Such an arrangement would have amounted to nothing more than combining prior art elements to yield predictable results, namely, combining known exhaust treatment system components with the SCR catalyst system of Hashimoto and Ohno so as to achieve the reduction of NO<sub>x</sub> in an exhaust stream.

Claim 2 depends from claim 1, and recites that the SCR catalyst composition that permeates the walls of the wall flow monolith so that the walls have a wall porosity of from 50 to 75% with an average pore size of from 5 to 30 microns. The filter of Hashimoto appears to be the same filter (DHC-611) employed in the examples of the ‘597 Patent, and has a porosity of 59% and a mean pore size of 25 μm. Thus, this claim would have been obvious over Hashimoto in view of Ohno and Schafer-Sindlinger.

With respect to claim 3, this claim is dependent on claim 1 and recites that the SCR catalyst composition comprises a zeolite and base metal component selected from one or more of a copper and iron component. As discussed above, Schafer-Sindlinger discloses an SCR catalyst that is zeolite with a copper base metal component. Paras. [0012]-[0013]. Accordingly, claim 3 of the ‘597 Patent is rendered unpatentable by the combination of Hashimoto, Ohno, and Schafer-Sindlinger.

Claim 4 depends from claim 3, and specifies that the base metal component is a copper component. As discussed above, Schafer-Sindlinger discloses an SCR catalyst that is zeolite with a copper base metal component. Paras. [0012]-[0013]. Therefore, claim 4 is unpatentable over the combination of Hashimoto, Ohno, and Schafer-Sindlinger.

Claim 5 is dependent on claim 4, and recites that the zeolite of the SCR catalyst has a silica to alumina ratio of least about 10. Schafer-Sindlinger discloses an example zeolite SCR

catalyst that has a molar ratio (“modulus”) of silica ( $\text{SiO}_2$ ) to alumina ( $\text{Al}_2\text{O}_3$ ) of 40. Para. [0037]. Thus, claim 5 is obvious over Hashimoto, Ohno, and Schafer-Sindlinger.

Regarding claim 6, this claim is dependent on claim 5 and recites that the zeolite of the SCR catalyst composition is a beta zeolite. Schafer-Sindlinger discloses that the zeolite SCR catalyst composition can be a beta zeolite. Para. [0013]. Thus, the combination of Hashimoto, Ohno, and Schafer-Sindlinger renders claim 6 unpatentable.

Claim 7, which depends from claim 1, recites that there is from 1.6 to 2.4  $\text{g/in}^3$  of SCR catalyst composition disposed on the wall flow monolith. This claim should be construed to mean that the loading of the SCR catalyst composition on the wall flow filter is between 1.6 to 2.4  $\text{g/in}^3$ . As discussed in detail above, it would have been obvious to load the SCR catalyst of Ohno onto the wall flow filter of Hashimoto with a washcoat loading of 100  $\text{g/l}$  (1.64  $\text{g/in}^3$ ). Thus, the combination of Hashimoto, Ohno, and Schafer-Sindlinger renders claim 7 obvious.

With respect to claim 8, this claim is dependent on claim 1 and recites that the oxidation catalyst comprises a platinum group metal component. Schafer-Sindlinger discloses that a platinum catalyst on a support material comprising active, optionally stabilized, aluminum oxide can be used as the oxidation catalyst in the system. Para. [0016]. Thus, claim 8 is unpatentable over the combination of Hashimoto, Ohno, and Schafer-Sindlinger.

Claim 10, which is dependent on claim 1, recites a diesel engine upstream of, and in fluid communication with, the oxidation catalyst. Schafer-Sindlinger indicates that an internal combustion engine such as a diesel engine can be provided upstream of the disclosed emission treatment system, thereby providing the exhaust stream for treatment in the system. *See* paras. [0003] and [0035]. Claim 10, therefore, would have been obvious in view of the combination of Hashimoto, Ohno, and Schafer-Sindlinger.

With respect to claim 11, which depends from claim 1, this claim recites that the oxidation catalyst is disposed on a honeycomb flow through monolith substrate or an open cell foam substrate. Schafer-Sindlinger discloses that the oxidation catalyst “is applied to a carrier which can be a conventional honeycomb structure in the form of a coating.” Para. [0016]. Moreover, the ‘597 Patent admits that metallic or ceramic foam substrates for supporting oxidation catalysts were well-known in the art. Col. 11, ll. 28-30. Thus, this claim would have been obvious over the combination of Hashimoto, Ohno, and Schafer-Sindlinger.

Regarding claim 12, this claim is dependent on claim 1 and recites that the injector comprises an aqueous urea reservoir and a pump. As discussed above, the treatment system of Schafer-Sindlinger includes an injector that adds urea to the exhaust gas. Para. [0035]. As such, the system of Schafer-Sindlinger would either inherently include a pump to supply the urea from the urea reservoir to the exhaust gas, or it would be clearly obvious to one of ordinary skill in the art to use a pump to supply the urea from the urea reservoir to the exhaust gas. Thus, the combination of Hashimoto, Ohno, and Schafer-Sindlinger renders claim 12 unpatentable.

Claim 13 is dependent from claim 1 and recites that the injector comprises gaseous nitrogen based reagent. Schafer-Sindlinger teaches that a compound is hydrolyzed to give ammonia, and then provided through the injector into the exhaust gas stream. Para. [0019]. As such, Schafer-Sindlinger clearly provides a gaseous nitrogen based reagent (ammonia) to the injector. Accordingly claim 13 is rendered unpatentable by the combination of Hashimoto, Ohno, and Schafer-Sindlinger.

Claim 14, which is dependent on claim 1, recites that the inlet passages of the wall flow monolith are coated with SCR catalyst. The catalyst of Ohno is present throughout the walls of the filter, which have an inlet side and an opposing outlet side. P. 7, ll. 3-8, Figs. 3(a) and 3(b). Thus, this claim would have been obvious in view of the combination of Hashimoto, Ohno, and Schafer-Sindlinger.

Claim 15, which is dependent on claim 14, specifies that the inlet passages and the outlet passages are coated with SCR catalyst. The catalyst of Ohno is present throughout the walls of the filter, which have an inlet side and an opposing outlet side. P. 7, ll. 3-8, Figs. 3(a) and 3(b). Thus, this claim would have been obvious in view of the combination of Hashimoto, Ohno, and Schafer-Sindlinger.

Accordingly, Requester submits that the combination of Hashimoto, Ohno, and Schafer-Sindlinger raises a substantial new question of patentability of claims 1-8 and 10-15, and in fact, renders these claims obvious.

**1. Claim 9 is unpatentable under 35 U.S.C. § 103(a) as being obvious over Hashimoto in view of Ohno, Schafer-Sindlinger and International Publication No. WO 01/96717 (Chapman)**

As discussed above, the combination of Hashimoto, Ohno, and Schafer-Sindlinger is non-cumulative and renders unpatentable claims 1-8 and 10-15 of the '597 Patent. The combination

of Hashimoto, Ohno, Schafer-Sindlinger, and Chapman is also non-cumulative for the same reasons.

Claim 9 is dependent from claim 8 and recites that the oxidation catalyst further comprises a zeolite component. As discussed above, the emission gas treatment system of Schafer-Sindlinger includes an oxidation catalyst for increasing the nitrogen dioxide content in an exhaust gas stream. Figure 1; para. [0015]. In particular, Schafer-Sindlinger indicates that the oxidation catalyst is applied to a carrier in the form of a coating on a conventional honeycomb structure. Para. [0016]. Schafer-Sindlinger further teaches that the oxidation catalyst be provided on a “high surface area support oxide.” Para. [0018].

Chapman discloses a system for treatment of exhaust gas, e.g., from a diesel engine. *See, e.g.*, p. 1, ll. 10-11. The system includes an oxidation catalyst promoting oxidation of nitrogen oxide to nitrogen dioxide, so that the nitrogen dioxide can be reduced with ammonia or an ammonia precursor using a downstream SCR catalyst. P. 11, ll. 13-19. Chapman further teaches that the oxidation catalyst can be provided as a washcoat on a flow through honeycomb monolith, with the washcoat including a high surface area oxide such as a zeolite. P. 3, l. 31 to p. 4, l. 1.

Accordingly, Chapman indicates that zeolites were known in the art for supporting oxidation catalysts in coatings applied to honeycomb structures in exhaust treatment systems. Further, it would have been obvious to one of ordinary skill in the art that a zeolite would satisfy the “high surface area support oxide” for supporting the oxidation catalyst specified by Schafer-Sindlinger. Therefore, it would have been obvious to one of ordinary skill in the art to use the known technique of a zeolite support for the oxidation catalyst in the system of Schafer-Sindlinger.

Accordingly, Requester submits that the combination of Hashimoto, Ohno, and Schafer-Sindlinger raises a substantial new question of patentability of claim 9, and in fact, renders this claim obvious.

**B. Proposed New Ground of Rejection of Claims 1, 2, 7, 8, and 10-15 as Being Obvious Over Hashimoto in View of WO 02/26351 (Ohno) and U.S. Patent No. 6,928,806 (Tennison)**

This combination is non-cumulative for at least the reason that it discloses a catalyst coating that permeates the walls of a wall flow filter not previously considered during prosecution. Hashimoto and Ohno also independently disclose that their catalyst coated wall

flow filters keep the pressure loss of the exhaust low when the amount of the catalyst on the filter is increased, which results in the combination rendering obvious the claimed features of SCR catalyst applied to a wall flow monolith. The Applicants argued that such features were not taught by the prior art during prosecution of the '659 Application that led to the '597 Patent, and the Examiner cited such features as not being disclosed or suggested by the prior art in the reasons for allowance of the '659 Application. See '659 Application, November 27, 2006 Amendment, p. 6; December 28, 2006 Notice of Allowability, p. 2. In fact, Dr. Blakeman makes clear that high porosity wall flow monoliths, such as disclosed in Hashimoto, were specifically developed for supporting catalysts in exhaust systems. Blakeman Decl. (A), ¶10. Thus, this combination provides a new, non-cumulative teaching that was not previously considered during the prosecution of the '597 Patent.

Hashimoto discloses a catalyzed diesel particulate filter (DPF), inside whose pores a washcoat containing catalyst for soot oxidation is applied. Paragraph below Figure 20. Hashimoto also suggests the use of a NO<sub>x</sub> adsorption catalyst with relatively high porosity filter. *Id.* The filter of Hashimoto appears to be the same filter (DHC-611) employed in the examples of the '597 Patent. *Id.* at Table 3. It meets all the elements related to the wall flow monolith in claimed system. The high porosity washcoat catalyzed wall flow filter of Hashimoto is essentially made of a wall flow filter with a washcoat of a catalyst and would not materially alter the nature of the claimed catalyst article. Paragraph below Figure 20. Hashimoto also discloses that a washcoat of 100 g/l (1.64 g/in<sup>3</sup>) on a wall flow filter having a porosity of 59% and a mean pore size of 25 µm had a favorable low pressure drop. *Id.*, col. containing Figure 20, Table 3. Hashimoto makes clear that high porosity material can be coated with significantly higher washcoat loading without adversely effecting pressure-drop. *Id.*

Ohno discloses a catalyst holding filter capable of efficiently conducting oxidation removal of carbon monoxide and hydrocarbon and reduction of nitrogen oxide (NO<sub>x</sub>) included in an exhaust gas. See, e.g., Ohno, p. 1, ll. 7-9. The pores in the cell walls of the wall flow monolith of Ohno are covered by a catalyst coat layer. P. 7, ll. 3-8 and Figs. 1-3. The application of a platinum catalyst is exemplified. P. 34, ll. 11-13. Ohno makes clear that the catalyst can be an SCR catalyst or an occlusion catalyst to deoxidize NO<sub>x</sub>. P. 28, ll. 13-15.

Regarding the meaning of the claim term "permeates", the '597 Patent at col. 10, ll. 21-22 states that permeate "means that the catalyst composition is dispersed throughout the wall of



the substrate.” To say that the catalytic material is “dispersed throughout the wall of the substrate” (emphasis added) must mean that the catalytic material is dispersed throughout the wall surface and the network of pores of the filter that extend from one side of the filter walls to the other side of the filter walls. Request, p. 12. The Patent Owner has not disagreed.

Regarding the concentration of SCR catalyst being at least  $1.3 \text{ g/in}^3$ , Hashimoto discloses a wall flow filter with a washcoat loading of  $100 \text{ g/l}$  ( $1.64 \text{ g/in}^3$ ). *See, e.g.*, col. containing Figure 20. It follows that it would have been obvious to load the SCR catalyst of Ohno onto the wall flow filter of Hashimoto with a washcoat loading of  $100 \text{ g/l}$  ( $1.64 \text{ g/in}^3$ ).

Thus, the combination of Hashimoto and Ohno teaches and suggests the wall flow monolith comprising an SCR catalyst as recited in claim 1. Ohno further contemplates the use of its NO<sub>x</sub> reduction technology as part of a system for treatment of exhaust from an engine, and Hashimoto suggests the use of its wall flow monolith in such a system by noting that catalyzed configurations of the wall flow monolith could include NO<sub>x</sub> adsorption catalyst. Ohno, p. 1, ll. 6-10; Hashimoto, col. containing Figure 20. As evidenced by Tennison, the other features of exhaust treatment system recited in claim 1 are well known in the art, and would have been readily included with the SCR catalyst suggested by Hashimoto and Ohno.

Tennison discloses a system for control of NO<sub>x</sub> and particulate matter emissions in a lean burn engine, such as a diesel engine. *See, e.g.*, col. 1, ll. 51-62. The system of Tennison includes an oxidation catalyst 13 for rapid conversion of hydrocarbons (HC), carbon monoxide (CO), and nitrous oxide (NO). Col. 3, ll. 54-57, Fig. 2A. The system further comprises an injector 16 in fluid communication with and downstream of the oxidation catalyst. Col. 3, ll. 31-35, Fig. 2A. The injector meters a reductant into the exhaust stream. *Id.* The reductant is derived from urea (an ammonia precursor), and is periodically metered by a pump through a control valve, with the pump and control valve being controlled by a controller. Col. 3, ll. 31-37.

The system of Tennison further comprises an SCR catalyst 14 downstream of the injector for reducing oxides of nitrogen in the exhaust stream with the injected reductant. Col. 3, ll. 31-35; Fig. 2A. The SCR catalyst is, preferably, a base metal/zeolite formulation with optimum NO<sub>x</sub> conversion performance in the range of 200-500 °C. Col. 3, ll. 28-31.

Thus, it would have been obvious to one of ordinary skill in the art to have provided an exhaust treatment system with an oxidation catalyst and ammonia injector, as taught by Tennison, upstream of the wall flow monolith comprising an SCR catalyst suggested by Ohno

and Speronello. Such an arrangement would have amounted to nothing more than combining prior art elements to yield predictable results, namely, combining known exhaust treatment system components with the SCR catalyst system of Hashimoto and Ohno so as to achieve reduction of NO<sub>x</sub> in an exhaust stream.

Accordingly, Requester submits that the combination of Hashimoto, Ohno, and Tennison raises a substantial new question of patentability of claim 1 of the '597 Patent, and in fact, renders this claim unpatentable.

Claim 2 depends from claim 1, and recites that the SCR catalyst composition that permeates the walls of the wall flow monolith so that the walls have a wall porosity of from 50 to 75% with an average pore size of from 5 to 30 microns. The filter of Hashimoto appears to be the same filter (DHC-611) employed in the examples of the '597 Patent, and has a porosity of 59% and a mean pore size of 25  $\mu\text{m}$ . Thus, this claim would have been obvious over Hashimoto in view of Ohno and Tennison.

Claim 7, which depends from claim 1, recites that there is from 1.6 to 2.4 g/in<sup>3</sup> of SCR catalyst composition disposed on the wall flow monolith. This claim should be construed to mean that the loading of the SCR catalyst composition on the wall flow filter is between 1.6 to 2.4 g/in<sup>3</sup>. As discussed in detail above, it would have been obvious to load the SCR catalyst of Ohno onto the wall flow filter of Hashimoto with a washcoat loading of 100 g/l (1.64 g/in<sup>3</sup>). Thus, the combination of Hashimoto, Ohno, and Tennison renders claim 7 obvious.

With respect to claim 8, this claim is dependent on claim 1 and recites that the oxidation catalyst comprises a platinum group metal component. Tennison discloses that the oxidation catalyst is a precious metal catalyst preferably containing platinum. Col. 3, ll. 54-57. Thus, claim 8 is unpatentable over the combination of Hashimoto, Ohno, and Tennison.

Claim 10, which is dependent on claim 1, recites a diesel engine upstream of, and in fluid communication with, the oxidation catalyst. Tennison indicates that the disclosed system achieves effective control of NO<sub>x</sub> and particulate matter in emissions from a lean burn engine, such as a diesel engine. Col. 1, ll. 51-55. Claim 10, therefore, would have been obvious in view of the combination of Hashimoto, Ohno, and Tennison.

With respect to claim 11, which depends from claim 1, this claim recites that the oxidation catalyst is disposed on a honeycomb flow through monolith substrate or an open cell foam substrate. The '597 Patent admits that metallic or ceramic foam substrates for supporting

oxidation catalysts were well-known in the art. Col. 11, ll. 28-30. Thus, this claim would have been obvious over the combination of Hashimoto, Ohno, and Tennison.

Regarding claim 12, this claim is dependent on claim 1 and recites that the injector comprises an aqueous urea reservoir and a pump. The system of Tennison includes a urea storage vessel, with urea from the vessel being delivered to the injector 16. Col. 3, ll. 31-35. Thus, the system of Tennison either includes a pump for delivery of the urea, or it would it have been readily obvious to one of ordinary skill in the art to use a well-known pump for delivery of the urea from the storage vessel to the injector. Thus, the combination of Hashimoto, Ohno, and Tennison renders claim 12 unpatentable.

Claim 13 is dependent from claim 1 and recites that the injector comprises gaseous nitrogen based reagent. Tennison discloses that urea is vaporized by a heating element, and then injected into the exhaust gas mixture. Col. 3, ll. 37-41. Thus, the injector of Tennison comprises a gaseous nitrogen based reagent, and claim 13 is rendered unpatentable by the combination of Hashimoto, Ohno, and Tennison.

Claim 14, which is dependent on claim 1, recites that the inlet passages of the wall flow monolith are coated with SCR catalyst. The catalyst of Ohno is present throughout the walls of the filter, which have an inlet side and an opposing outlet side. P. 7, ll. 3-8, Figs. 3(a) and 3(b). Thus, this claim would have been obvious in view of the combination of Hashimoto, Ohno, and Tennison.

Claim 15, which is dependent on claim 14, specifies that the inlet passages and the outlet passages are coated with SCR catalyst. The catalyst of Ohno is present throughout the walls of the filter, which have an inlet side and an opposing outlet side. P. 7, ll. 3-8, Figs. 3(a) and 3(b). Thus, this claim would have been obvious in view of the combination of Hashimoto, Ohno, and Tennison.

Accordingly, Requester submits that the combination of Hasimoto, Ohno, and Tennison raises a substantial new question of patentability of claims 1, 2, 7, 8 and 10-15, and in fact, renders these claims obvious.

**1. Claims 3-6 are unpatentable under 35 U.S.C. § 103(a) as being obvious over Hashimoto in view of Ohno, Tennison, and U.S. Patent No. 5,516,497 (Speronello)**

As discussed above, the combination of Hasimoto, Ohno, and Tennison is non-cumulative and renders unpatentable claims 1, 2, 7, 8, and 10-15. The combination of Hasimoto, Ohno, Tennison, and Speronello is also non-cumulative for the same reasons.

Claim 3 is dependent on claim 1 and recites that the SCR catalyst composition comprises a zeolite and base metal component selected from one or more of a copper and iron component. As discussed above, Tennison teaches an SCR catalyst. Tennison further specifies that the SCR catalyst is preferably a "base metal/zeolite formulation." Col. 3, ll. 28-31.

Speronello discloses metal promoted zeolite catalyst and the use of such a catalyst in the selective catalytic reduction of oxides of nitrogen with ammonia, and indicates that the metal be copper or iron. Col. 2, ll. 60-66, col. 5, ll. 52-58. Therefore, it would have been obvious to one of ordinary skill in the art to use an SCR catalyst that comprises metal (iron and/or copper)-promoted zeolite catalyst, as disclosed by Speronello in the wall flow filter of Hashimoto and Ohno. This would have amounted to nothing more than applying a known technique to a known device, and further, would have provided the "base metal/zeolite formulation" specified by Tennison. Claim 3, therefore, is rendered unpatentable by the combination of Hasimoto, Ohno, Tennison, and Speronello.

Claim 4, which depends from claim 3, recites that the base metal component is a copper component. Speronello discloses an SCR catalyst that is a beta zeolite containing 3.23% by weight copper. Example 1.VII. at col. 11, ll. 44-45. Therefore, in conjunction with using the SCR catalyst of Speronello in the wall flow filter of Hashimoto and Ohno (as discussed with respect to claim 3 above), it further would have been obvious to one of ordinary skill in the art to use an SCR catalyst in the wall flow filter of Hashimoto and Ohno that comprises a copper-promoted zeolite catalyst, as disclosed in Speronello. Accordingly, claim 4 is rendered unpatentable by the combination of Hasimoto, Ohno, Tennison, and Speronello.

Claim 5, which depends from claim 4, recites that the zeolite of the SCR catalyst composition has a silica to alumina ratio of at least about 10. The silicon to aluminum ratio of the SCR catalysts of Speronello is at least 10. Col. 6, ll. 60-61. Therefore, in conjunction with using the SCR catalyst of Speronello in the wall flow filter of Hashimoto and Ohno (as discussed with respect to claims 3 and 4 above), it would have been obvious to one of ordinary skill in the

art to use an SCR catalyst composition in the wall flow filter of Hashimoto and Ohno that is a copper-promoted beta zeolite with a silica to alumina ratio of at least 10, as disclosed in Speronello. Claim 5, therefore, is unpatentable over the combination of Hasimoto, Ohno, Tennison, and Speronello.

Claim 6, which depends from claim 5, recites that the zeolite of the SCR catalyst composition is a beta zeolite. The SCR catalyst of Speronello can be a beta zeolite. Example 1.VII. at col. 11, ll. 44-45. Therefore, in conjunction with using the SCR catalyst of Speronello in the wall flow filter of Hashimoto and Ohno (as discussed with respect to claims 3-5 above), it would have been obvious to one of ordinary skill in the art to use an SCR catalyst composition in the wall flow filter of Hashimoto and Ohno that includes a beta zeolite. Therefore, claim 6 is rendered unpatentable by the combination of Hasimoto, Ohno, Tennison, and Speronello.

Thus, Requester submits that the combination of Hasimoto, Ohno, Tennison, and Speronello raises a substantial new question of patentability of claims 3-6, and in fact, renders these claims obvious.

**2. Claim 9 is unpatentable under 35 U.S.C. § 103(a) as being obvious over Hashimoto in view of Ohno, Tennison, and International Publication No. WO 01/96717 (Chapman)**

As discussed above, the combination of Hasimoto, Ohno, and Tennison is non-cumulative and renders unpatentable claims 1, 2, 7, 8, and 10-15 of the '597 Patent. The combination of Hasimoto, Ohno, Tennison, and Chapman is also non-cumulative for the same reasons.

Claim 9 is dependent from claim 8 and recites that the oxidation catalyst further comprises a zeolite component. As discussed above, the emission gas treatment system of Tennison includes an oxidation catalyst for rapid conversion of hydrocarbons (HC), carbon monoxide (CO) and nitrous oxide (NO). Col. 3, ll. 54-57.

Chapman discloses a system for treatment of exhaust gas, e.g., from a diesel engine. *See, e.g.,* p. 1, ll. 10-11. The system of Chapman includes an oxidation catalyst promoting oxidation of nitrogen oxide to nitrogen dioxide, so that the nitrogen dioxide can be reduced with ammonia or an ammonia precursor using a downstream SCR catalyst. P. 11, ll. 13-19. Chapman further teaches that the oxidation catalyst can be provided as a washcoat on a flow through honeycomb monolith, with the washcoat including a high surface area oxide such as a zeolite. P. 3, l. 31 to p.

4, l. 1. Moreover, Tennison itself indicates that zeolites are known in the art by teaching the use of zeolites for the SCR catalyst. Col. 3, ll. 28-31.

Accordingly, Chapman indicates that zeolites were known in the art for supporting oxidation catalysts in exhaust treatment systems, and it was generally known in the art that zeolites provide a high surface area support for catalysts. Therefore, it would have been obvious to one of ordinary skill in the art to use the known technique of a zeolite support for the oxidation catalyst system suggested by the combination of Hasimoto, Ohno, and Tennison.

Thus, Requester submits that the combination of Hasimoto, Ohno, Tennison, and Chapman raises a substantial new question of patentability of claim 9, and in fact, renders this claim obvious.

**C. Proposed New Ground of Rejection of Claims 1, 2, 7, 8, and 10-15 as Being Obvious Over Hashimoto in View of U.S. Patent Application Pub. No. 2003/0101718 (Pfeifer) and U.S. Patent No. 6,928,806 (Tennison)**

This combination is non-cumulative for at least the reason that it discloses a catalyst coating that permeates the walls of a wall flow filter not previously considered during prosecution. Hashimoto also discloses that its catalyst coated wall flow filter keeps the pressure loss of the exhaust low when the amount of the catalyst on the filter is increased, which results in the combination of references rendering obvious the claimed features of SCR catalyst applied to a wall flow monolith. The Applicants argued that such features were not taught by the prior art during prosecution of the '659 Application that led to the '597 Patent, and the Examiner cited such features as not being disclosed or suggested by the prior art in the reasons for allowance of the application that led to the '659 Application. *See* '659 Application, November 27, 2006 Amendment, p. 6; December 28, 2006 Notice of Allowability, p. 2. In fact, Dr. Blakeman makes clear that high porosity wall flow monoliths, such as disclosed in Hashimoto, were specifically developed for supporting catalysts in exhaust systems. Blakeman Decl. (A), ¶10. Thus, this combination provides a new, non-cumulative teaching that was not previously considered during the prosecution of the '597 Patent.

Hashimoto discloses a catalyzed diesel particulate filter (DPF), inside whose pores a washcoat containing catalyst for soot oxidation is applied. Paragraph below Figure 20. Hashimoto also suggests the use of a NO<sub>x</sub> adsorption catalyst with a relatively high porosity filter. *Id.* The filter of Hashimoto appears to be the same filter (DHC-611) employed in the examples of the '597 Patent. *Id.* at Table 3. It meets all the claim elements related to filter. The

high porosity washcoat catalyzed wall flow filter of Hashimoto is essentially made of a wall flow filter with a washcoat of a catalyst and would not materially alter the nature of the claimed catalyst article. Paragraph below Figure 20. Hashimoto also discloses that a washcoat of 100 g/l (1.64 g/in<sup>3</sup>) on a wall flow filter having a porosity of 59% and a mean pore size of 25 μm had a favorable low pressure drop. *Id.*, col. containing Figure 20, Table 3. Hashimoto makes clear that high porosity material can be coated with significantly higher washcoat loading without adversely effecting pressure-drop. *Id.*

Pfeifer discloses a catalyst-carrying porous support for the conversion of gaseous pollutants in the exhaust gas of combustion engines. *See, e.g.*, Pfeifer, para [0023]. The walls and the pores of the walls of the wall flow filter of Pfeifer are coated by a catalytic material. Paras. [0028], [0029], [0035], abstract. It is explicitly stated that the catalyst of Pfeifer can be an SCR catalyst. Paras. [0031] and [0032]. Pfeifer also makes clear that alternative catalysts for inclusion on a high porosity filter include NO<sub>x</sub>-storage catalysts, SCR-catalysts, diesel oxidation catalysts and HC-DeNO<sub>x</sub> catalysts. Paras. [0045]-[0048].

Regarding the meaning of the claim term “permeates”, the ‘597 Patent at col. 10, ll. 21-22 states that permeate “means that the catalyst composition is dispersed throughout the wall of the substrate.” To say that the catalytic material is “dispersed *throughout* the wall of the substrate” (emphasis added) must mean that the catalytic material is dispersed throughout the wall surface and the network of pores of the filter that extend from one side of the filter walls to the other side of the filter walls. Request, p. 12. The Patent Owner has not disagreed.

Regarding the concentration of SCR catalyst being at least 1.3 g/in<sup>3</sup>, Hashimoto discloses a wall flow filter with a washcoat loading of 100 g/l (1.64 g/in<sup>3</sup>). *See, e.g.*, col containing Figure 20. It would have been obvious to load the SCR catalyst of Pfeifer onto the wall flow filter of Hashimoto with a washcoat loading of 100 g/l (1.64 g/in<sup>3</sup>). Thus, the combination of Hashimoto and Pfeifer renders amended claim 1 obvious.

Thus, the combination of Hashimoto and Pfeifer teaches and suggests the wall flow monolith comprising an SCR catalyst as recited in claim 1. Pfeifer further indicates that the wall flow monolith can be used in a system to purify exhaust gas emitted from the internal combustion of a diesel engine. Pfeifer, para. [0027]. In fact, Pfeifer teaches that the wall flow filter can be used as part of a system for SCR of NO<sub>x</sub> that includes adding ammonia or an ammonia precursor to the exhaust stream as a reducing agent. Para. [0042]. Hashimoto also

suggests the use of its wall flow monolith in such a system by noting that catalyzed configurations of the wall flow monolith could include NO<sub>x</sub> adsorption catalyst. Hashimoto, col. containing Figure 20. As evidenced by Tennison, the other features of exhaust treatment system recited in claim 1 are well known in the art, and would have been readily included with the SCR catalyst suggested by Hashimoto and Pfeifer.

Tennison discloses a system for control of NO<sub>x</sub> and particulate matter emissions in a lean burn engine, such as a diesel engine. *See, e.g.*, col. 1, ll. 51-62. The system of Tennison includes an oxidation catalyst 13 for rapid conversion of hydrocarbons (HC), carbon monoxide (CO), and nitrous oxide (NO). Col. 3, ll. 54-57, Fig. 2A. The system further comprises an injector 16 in fluid communication with and downstream of the oxidation catalyst. Col. 3, ll. 31-35, Fig. 2A. The injector meters a reductant into the exhaust stream. *Id.* The reductant is derived from urea (an ammonia precursor), and is periodically metered by a pump through a control valve, with the pump and control valve being controlled by a controller. Col. 3, ll. 31-37.

The system of Tennison further comprises an SCR catalyst 14 downstream of the injector for reducing oxides of nitrogen in the exhaust stream with the injected reductant. Col. 3, ll. 31-35; Fig. 2A. The SCR catalyst is, preferably, a base metal/zeolite formulation with optimum NO<sub>x</sub> conversion performance in the range of 200-500 °C. Col. 3, ll. 28-31.

Thus, it would have been obvious to one of ordinary skill in the art to have provided an exhaust treatment system with an oxidation catalyst and ammonia injector, as taught by Tennison, upstream of the wall flow monolith comprising an SCR catalyst suggested by Hashimoto and Pfeifer. Such an arrangement would have amounted to nothing more than combining prior art elements to yield predictable results, namely, combining known exhaust treatment system components with the SCR catalyst system of Hashimoto and Pfeifer so as to achieve reduction of NO<sub>x</sub> in an exhaust stream.

Accordingly, Requester submits that the combination of Hashimoto, Pfeifer, and Tennison raises a substantial new question of patentability of claim 1 of the '597 Patent, and in fact, renders this claim unpatentable.

Claim 2 depends from claim 1, and recites that the SCR catalyst composition that permeates the walls of the wall flow monolith so that the walls have a wall porosity of from 50 to 75% with an average pore size of from 5 to 30 microns. The filter of Hashimoto appears to be the same filter (DHC-611) employed in the examples of the '597 Patent, and has a porosity of



59% and a mean pore size of 25  $\mu\text{m}$ . Thus, this claim would have been obvious over Hashimoto in view of Pfeifer and Tennison.

Claim 7, which depends from claim 1, recites that there is from 1.6 to 2.4  $\text{g}/\text{in}^3$  of SCR catalyst composition disposed on the wall flow monolith. This claim should be construed to mean that the loading of the SCR catalyst composition on the wall flow filter is between 1.6 to 2.4  $\text{g}/\text{in}^3$ . As discussed in detail above, it would have been obvious to load the SCR catalyst of Ohno onto the wall flow filter of Hashimoto with a washcoat loading of 100  $\text{g}/\text{l}$  (1.64  $\text{g}/\text{in}^3$ ). Thus, the combination of Hashimoto, Pfeifer, and Tennison renders claim 7 obvious.

With respect to claim 8, this claim is dependent on claim 1 and recites that the oxidation catalyst comprises a platinum group metal component. Tennison discloses that the oxidation catalyst is a precious metal catalyst preferably containing platinum. Col. 3, ll. 54-57. Thus, claim 8 is unpatentable over the combination of Hashimoto, Pfeifer, and Tennison.

Claim 10, which is dependent on claim 1, recites a diesel engine upstream of, and in fluid communication with, the oxidation catalyst. Tennison indicates that the disclosed system achieves effective control of  $\text{NO}_x$  and particulate matter in emissions from a lean burn engine, such as a diesel engine. Col. 1, ll. 51-55. Claim 10, therefore, would have been obvious in view of the combination of Hashimoto, Pfeifer, and Tennison.

With respect to claim 11, which depends from claim 1, this claim recites that the oxidation catalyst is disposed on a honeycomb flow through monolith substrate or an open cell foam substrate. The '597 Patent admits that metallic or ceramic foam substrates for supporting oxidation catalysts are well-known in the art. Col. 11, ll. 28-30. Thus, this claim would have been obvious over the combination of Hashimoto, Pfeifer, and Tennison.

Regarding claim 12, this claim is dependent on claim 1 and recites that the injector comprises an aqueous urea reservoir and a pump. The system of Tennison includes a urea storage vessel, with urea from the vessel being delivered to the injector 16. Col. 3, ll. 31-35. Thus, the system of Tennison either includes a pump for delivery of the urea, or it would it have been readily obvious to one of ordinary skill in the art to use a well-known pump for delivery of the urea from the storage vessel to the injector. Thus, the combination of Hashimoto, Pfeifer, and Tennison renders claim 12 unpatentable.

Claim 13 is dependent from claim 1 and recites that the injector comprises gaseous nitrogen based reagent. Tennison discloses that urea is vaporized by a heating element, and then

injected into the exhaust gas mixture. Col. 3, ll. 37-41. Thus, the injector of Tennison comprises a gaseous nitrogen based reagent, and claim 13 is rendered unpatentable by the combination of Hashimoto, Pfeifer, and Tennison.

Claim 14, which is dependent on claim 1, recites that the inlet passages of the wall flow monolith are coated with SCR catalyst. Pfeifer makes clear that the catalyst washcoat is preferably applied to both sides of the walls as well as throughout the pores. *See, e.g.*, paragraph [0040], Figure 2. Thus, this claim would have been obvious in view of the combination of Hashimoto, Pfeifer, and Tennison.

Claim 15, which is dependent on claim 14, specifies that the inlet passages and the outlet passages are coated with SCR catalyst. Pfeifer makes clear that the catalyst washcoat is preferably applied to both sides of the walls as well as throughout the pores. *See, e.g.*, paragraph [0040], Figure 2. Thus, this claim would have been obvious in view of the combination of Hashimoto, Pfeifer, and Tennison.

Accordingly, Requester submits that the combination of Hashimoto, Pfeifer, and Tennison raises a substantial new question of patentability of claims 1, 2, 7, 8 and 10-15, and in fact, renders these claims obvious.

**1. Claims 3-6 are unpatentable under 35 U.S.C. § 103(a) as being obvious over Hashimoto in view of Pfeifer, Tennison, and U.S. Patent No. 5,516,497 (Speronello)**

As discussed above, the combination of Hashimoto, Pfeifer, and Tennison is non-cumulative and renders unpatentable claims 1, 2, 7, 8, and 10-15. The combination of Hashimoto, Pfeifer, Tennison, and Speronello is also non-cumulative for the same reasons.

Claim 3 is dependent on claim 1 and recites that the SCR catalyst composition comprises a zeolite and base metal component selected from one or more of a copper and iron component. As discussed above, Tennison teaches an SCR catalyst. Tennison further specifies that the SCR catalyst is preferably a "base metal/zeolite formulation." Col. 3, ll. 28-31.

Speronello discloses metal promoted zeolite catalyst and the use of such a catalyst in the selective catalytic reduction of oxides of nitrogen with ammonia, and indicates that the metal be copper or iron. Col. 2, ll. 60-66, col. 5, ll. 52-58. Therefore, it would have been obvious to one of ordinary skill in the art to use an SCR catalyst that comprises metal (iron and/or copper)-promoted zeolite catalyst, as disclosed by Speronello in the wall flow filter of Hashimoto and Ohno. This would have amounted to nothing more than applying a known technique to a known

device, and further, would have provided the "base metal/zeolite formulation" specified by Tennison. Claim 3, therefore, is rendered unpatentable by the combination of Hasimoto, Pfeifer, Tennison, and Speronello.

Claim 4, which depends from claim 3, recites that the base metal component is a copper component. Speronello discloses an SCR catalyst that is a beta zeolite containing 3.23% by weight copper. Example 1.VII. at col. 11, ll. 44-45. Therefore, in conjunction with using the SCR catalyst of Speronello in the wall flow filter of Hashimoto and Pfeifer (as discussed with respect to claim 3 above), it further would have been obvious to one of ordinary skill in the art to use an SCR catalyst in the wall flow filter of Hashimoto and Pfeifer that comprises a copper-promoted zeolite catalyst, as disclosed in Speronello. Accordingly, claim 4 is rendered unpatentable by the combination of Hasimoto, Pfeifer, Tennison, and Speronello.

Claim 5, which depends from claim 4, recites that the zeolite of the SCR catalyst composition has a silica to alumina ratio of at least about 10. The silicon to aluminum ratio of the SCR catalysts of Speronello is at least 10. Col. 6, ll. 60-61. Therefore, in conjunction with using the SCR catalyst of Speronello in the wall flow filter of Hashimoto and Pfeifer (as discussed with respect to claims 3 and 4 above), it would have been obvious to one of ordinary skill in the art to use an SCR catalyst composition in the wall flow filter of Hashimoto and Pfeifer that is a copper-promoted beta zeolite with a silica to alumina ratio of at least 10, as disclosed in Speronello. Claim 5, therefore, is unpatentable over the combination of Hasimoto, Pfeifer, Tennison, and Speronello.

Claim 6, which depends from claim 5, recites that the zeolite of the SCR catalyst composition is a beta zeolite. The SCR catalyst of Speronello can be a beta zeolite. Example 1.VII. at col. 11, ll. 44-45. Therefore, in conjunction with using the SCR catalyst of Speronello in the wall flow filter of Hashimoto and Pfeifer (as discussed with respect to claims 3-5 above), it would have been obvious to one of ordinary skill in the art to use an SCR catalyst composition in the wall flow filter of Hashimoto and Pfeifer that includes a beta zeolite. Therefore, claim 6 is rendered unpatentable by the combination of Hasimoto, Pfeifer, Tennison, and Speronello.

Thus, Requester submits that the combination of Hasimoto, Pfeifer, Tennison, and Speronello raises a substantial new question of patentability of claims 3-6, and in fact, renders these claims obvious.

2. **Claim 9 is unpatentable under 35 U.S.C. § 103(a) as being obvious over Hashimoto in view of Pfeifer, Tennison, and International Publication No. WO 01/96717 (Chapman)**

As discussed above, the combination of Hasimoto, Pfeifer, and Tennison is non-cumulative and renders unpatentable claims 1, 2, 7, 8, and 10-15. The combination of Hasimoto, Pfeifer, Tennison, and Chapman is also non-cumulative for the same reasons.

Claim 9 is dependent from claim 8 and recites that the oxidation catalyst further comprises a zeolite component. As discussed above, the emission gas treatment system of Tennison includes an oxidation catalyst for rapid conversion of hydrocarbons (HC), carbon monoxide (CO) and nitrous oxide (NO). Col. 3, ll. 54-57.

Chapman discloses a system for treatment of exhaust gas, e.g., from a diesel engine. See, e.g., p. 1, ll. 10-11. The system includes an oxidation catalyst promoting oxidation of nitrogen oxide to nitrogen dioxide, so that the nitrogen dioxide can be reduced with ammonia or an ammonia precursor using a downstream SCR catalyst. P. 11, ll. 13-19. Chapman further teaches that the oxidation catalyst can be provided as a washcoat on a flow through honeycomb monolith, with the washcoat including a high surface area oxide such as a zeolite. P. 3, l. 31 to p. 4, l. 1. Moreover, Tennison itself indicates that zeolites are known in the art by teaching the use of zeolites for the SCR catalyst. Col. 3, ll. 28-31.

Accordingly, Chapman indicates that zeolites were known in the art for supporting oxidation catalysts in exhaust treatment systems, and it was generally known in the art that zeolites provide a high surface area support for catalysts. Therefore, it would have been obvious to one of ordinary skill in the art to use the known technique of a zeolite support for the oxidation catalyst system suggested by the combination of Hasimoto, Pfeifer, and Tennison.

Thus, Requester submits that the combination of Hasimoto, Pfeifer, Tennison, and Chapman raises a substantial new question of patentability of claim 9, and in fact, renders this claim obvious.

V. **Grounds 3 and 4- Proposed Rejection of Claims 1-8 and 10-15 as being obvious over Schafer-Sindlinger in view of Japanese Patent Publication No. 09-173866 (Nakanishi) and of Claim 9 as being obvious over Schafer-Sindlinger in view of Nakanishi and Chapman**

Pages 8 and 9 of the Office Action state that the proposed rejection of claims 1-8 and 10-15 as being obvious over Schafer-Sindlinger in view of Nakanishi, and the proposed rejection of

claim 9 as being obvious over Shafer-Sindlinger in view of Nakanishi and Chapman, are not adopted. In this regard, the Office Action asserts that Nakanishi's teachings are drawn to a catalyst that filters soot, and not to an SCR catalyst that converts NO<sub>x</sub> to nitrogen. The Office Action concludes that there is not a *prima facie* case of obviousness because one of ordinary skill in the art would not have looked Nakanishi to modify the filter with SCR catalyst suggested by Schafer-Sindlinger.

Nakanishi is cited in the proposed rejection for teaching that a person of ordinary skill in the art could successfully apply a catalytic material in the amount of up to 2.95 g/in<sup>3</sup> to a wall flow filter in the system of Schafer-Sindlinger without an undesirable loss in pressure. Request, pp. 25-26. The fact that Nakanishi discloses a soot reduction catalyst would not have dissuaded a skilled artisan from considering the reference's technique (washcoat loading of a high porosity filter, see para. (0021)) for applying other types of catalysts to a wall flow monolith. Walker Decl. (C), ¶8. The function of the catalyst is not relevant as the catalyst loading technique of Nakanishi would have been considered applicable for any type of washcoat catalyst, including SCR catalysts<sup>10</sup>. *Id.* Instead, one of ordinary skill in the art would have understood that porosity of the filter and particle size of the washcoat composition were the key parameters in loading the filter without blocking the pores. Nakanishi, para. (0007); Walker Decl. (C), ¶8. Therefore, one of ordinary skill would have considered the washcoat technique of Nakanishi on a high porosity wall flow filter to be relevant for loading an SCR catalyst, as the use of the high porosity wall flow filter was considered for multiple types of catalytic washcoats. Walker Decl. (C), ¶8. Thus, a person of ordinary skill would have recognized that Nakanishi discloses a standard technique for applying amounts of washcoat catalyst composition to a high porosity wall flow monolith, and it would have been obvious to use such a catalyzed wall flow filter in the system of Schafer-Sindlinger, regardless of the particular type or function of the catalyst disclosed in the Nakanishi. *Id.*

Moreover, Nakanishi teaches an SCR catalyst in the form of platinum. *Id.* at para. (0014) on p. 3. As evidenced by Cohn, Heck and the Walker Declaration, one of ordinary skill in the art would have recognized that the platinum catalyst disclosed in Nakanishi is also an SCR catalyst for reduction of NO<sub>x</sub> with ammonia. Cohn, col. 2, ll. 13-21; Heck, Section 8.10.2 on p. 205;

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<sup>10</sup> In fact, the alumina washcoat of Nakanishi serves the same function as a zeolite washcoat, *i.e.*, to provide increased surface area for the provision of a catalyst metal, e.g., platinum, copper or iron.

Walker Decl. (C), ¶6. For this additional reason, one of ordinary skill in the art would have readily looked to Nakanishi as providing guidance on the amount of SCR catalyst that can be applied to the filter in the system suggested by the combination of Schafer-Sindlinger and Nakanishi.

It should also be noted that even if Nakanishi did lack the teaching of an SCR catalyst, the Office Action's reasoning would still be flawed. One cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. *In re Merck & Co., Inc.*, 800 F.2d 1091, 1097 (Fed. Cir. 1986). In this case, Schafer-Sindlinger clearly teach SCR catalyzed reduction of NO<sub>x</sub>, and thus, it is not necessary for Nakanishi to also teach an SCR catalyst for the reference to be used in an obvious combination rejection with Schafer-Sindlinger. That is, the collective teaching of the combination of references renders unpatentable claims of the '597 Patent.

Accordingly, for the reasons discussed in the Request, and for the reasons discussed above, the proposed rejection of claims 1-8 and 10-15 as being obvious over Schafer-Sindlinger in view of Nakanishi, and the proposed rejection of claim 9 as being obvious over Schafer-Sindlinger in view of Nakanishi and Chapman should be adopted.

**VI. Grounds 5 and 6- Proposed Rejection of Claims 1-8 and 10-15 as being obvious over U.S. Patent Application Publication No. 2003/0101718 (Pfeifer) in view of Nakanishi and Schafer-Sindlinger and of Claim 9 as being obvious over Pfeifer, Nakanishi, Schafer-Sindlinger and Chapman**

Pages 9 and 10 of the Office Action state that the proposed rejection of claims 1-8 and 10-15 as being obvious over Pfeifer in view of Nakanishi and Schafer-Sindlinger, and the proposed rejection of claim 9 as being obvious over Pfeifer in view of Nakanishi, Schafer-Sindlinger, and Chapman, are not adopted. In this regard, the Office Action characterizes Pfeifer as teaching an SCR catalyst, and the Office Action asserts that Nakanishi is directed to a filter that includes a catalyst for removal of soot, not an SCR catalyst that converts NO<sub>x</sub> to nitrogen. The Office Action concludes that one of ordinary skill in the art would not look to modify the filter of Pfeifer using the teaching of Nakanishi.

Initially, the Office Action is incorrect in its implicit assertion that Pfeifer is solely directed to filter that includes an SCR catalyst for NO<sub>x</sub> reduction. Pfeifer teaches that the filter may also include catalysts for oxidation of hydrocarbons, i.e., the removal of soot. Pfeifer, paras. [0046]-[0048]. In fact, Pfeifer expressly teaches that the filter may include catalysts, such as

“HC-DeNOx” catalysts, for the simultaneous reduction of NOx as well as the oxidation of hydrocarbons. *Id.* Thus, Pfeifer clearly establishes that a filter having a catalyst for SCR of NOx is not mutually exclusive from a filter having catalyst for soot removal. And it follows that one of ordinary skill in the art would have looked to the wall flow filter of Nakanishi for guidance on the application of catalyst to the wall flow filter of Pfeifer.

Nakanishi is cited in the proposed rejection for teaching from its working examples the wall porosity and pore size that may be used to produce a wall flow filter that avoids significant back pressure. Request, pp. 32-33. The fact that Nakanishi discloses a soot reduction catalyst would not have dissuaded a skilled artisan from considering the reference’s technique (washcoat loading of a high porosity filter, see para. (0021)) for applying other types of catalysts to a wall flow monolith. Walker Decl. (C), ¶8. The function of the catalyst is not relevant as the catalyst loading technique of Nakanishi would have been considered applicable for any type of washcoat catalyst, including SCR catalysts. *Id.* Instead, one of ordinary skill in the art would have understood that porosity of the filter and particle size of the washcoat composition were the key parameters in loading the filter without blocking the pores. Nakanishi, para. (0007); Walker Decl. (C), ¶8. Therefore, one of ordinary skill would have considered the washcoat technique of Nakanishi on a high porosity wall flow filter to be relevant for loading an SCR catalyst, as the use of the high porosity wall flow filter was considered for multiple types of catalytic washcoats. Walker Decl. (C), ¶8. Thus, a person of ordinary skill would have recognized that Nakanishi discloses a standard technique for applying amounts of washcoat catalyst composition to a high porosity wall flow monolith such as that disclosed by Pfeifer, regardless of the particular type or function of the catalyst disclosed in the Nakanishi. *Id.*

In sum, Nakanishi teaches an amount of catalyst that can be applied to a wall flow filter regardless of the particular catalyst, and one of ordinary skill in the art would consider this teaching as applicable to the wall flow filter of Pfeifer. The Office Action is incorrect in concluding that one of ordinary skill in the art would not look to modify the filter of Pfeifer using the teaching of Nakanishi.

Accordingly, for the reasons discussed in the Request, and for the reasons discussed above, the proposed rejection of claims 1-8 and 10-15 as being obvious over Pfeifer in view of Nakanishi, and Schafer-Sindlinger, and the proposed rejection of claim 9 as being obvious over Pfeifer in view of Nakanishi, Schafer-Sindlinger, and Chapman should be adopted.

**VII. Grounds 7 and 8- Proposed Rejection of Claims 1-8 and 10-15 as being obvious over Schafer-Sindlinger in view of EP 0766993A2 (Araki) and Heck, R.M. et al., “Catalytic Air Pollution Control,” (2d ed. 2002) (Heck), pp. 204-208 and of Claim 8 as being obvious over Schafer-Sindlinger in view of Araki, Heck, and Chapman**

Pages 10 and 11 of the Office Action state that the proposed rejection of claims 1-8 and 10-15 as being obvious over Schafer-Sindlinger in view of Araki and Heck, and the proposed rejection of claim 9 as being obvious over Schafer-Sindlinger in view of Araki, Heck, and Chapman, are not adopted. The Office Action asserts that it would not have been obvious for one of ordinary skill in the art to have substituted the Schafer-Sindlinger’s SCR catalyst with a NOx-absorber (as disclosed by Araki), and then revert back to an SCR catalyst.

The Office Action does not consider the collective teachings of the references. Instead, the Office Action’s reasoning would require one of ordinary skill to first look at Schafer-Sindlinger and Araki in isolation, and only thereafter consider the disclosure of Heck. This is not the proper consideration of an obvious combination rejection. Just as it is improper to consider a reference individually where a rejection is based on a combination of references, it is improper to consider two references in isolation where a rejection is based on three references. Indeed, it is often necessary to look to interrelated teachings of multiple patents, and “in many cases a person of ordinary skill in the art will be able to fit the teachings of multiple patents together like pieces of a puzzle.” *KSR International Co. v. Teleflex, Inc.*, 550 U.S. 398, 418, 420 (2007). In this case, the proposed rejection includes the combination of Schafer-Sindlinger, Araki, and Heck. Collectively, the references suggest (i) a wall flow filter, as taught and suggested by the combination of Schafer-Sindlinger and Araki, (ii) using the wall flow filter to reduce NOx, as suggested by both the disclosure in Schafer-Sindlinger’s of SCR catalysts and the disclosure in Araki’s of NOx absorbers, and (iii) the alternative nature of NOx absorbers and SCR catalysts, as taught by Heck. When considering these disclosures of the references, there is nothing that would have required one of ordinary skill in the art to have first substituted the Schafer-Sindlinger’s SCR catalyst with a NOx-adsorber, and then revert back to an SCR catalyst, as asserted in the Office Action.

Accordingly, for the reasons discussed in the Request, and for the reasons discussed above, that the proposed rejection of claims 1-8 and 10-15 as being obvious over Schafer-Sindlinger in view of Araki and Heck, and the proposed rejection of claim 9 as being obvious over Schafer-Sindlinger in view of Araki, Heck, and Chapman, should be adopted.



**VIII. Ground 9- Proposed Rejection of Claim 11 as being obvious over Ohno, Speronello, and Tennison**

Page 15 of the Office Action states that the proposed rejection of claim 11 using Ohno, Speronello and Tennison is not adopted. The Office Action asserts that Tennison does not teach or suggest an oxidation catalyst provided on a honeycomb structure. The Office Action also asserts at page 15 that the '597 Patent does not admit "that oxidation catalyst in honeycomb form are known in the art."

The Office Action has incorrectly interpreted claim 11 of the '597 Patent. Claim 11 recites "the oxidation catalyst is disposed on a honeycomb flow through monolith substrate *or* an open cell foam substrate." (Emphasis added). As the claim recites that honeycomb flow through monolith and the open cell foam substrate as alternatives, a prior art teaching of either alternative is sufficient to render the claim obvious. *See Brown v. 3M*, 265 F.3d 1349, 1351 (Fed. Cir. 2001) ("When a claim covers several structures or compositions, either generically or as alternatives, the claim is deemed anticipated if any of the structures or compositions within the scope of the claim is known in the prior art."). In this case, the '597 Patent admits that metallic or ceramic foam substrates for supporting oxidation catalysts were well-known in the art. Col. 11, ll. 28-30. Thus, given that the open cell foam substrate alternative was known in the art, the claim would have been obvious over the combination of Ohno, Speronello, and Tennison.

Accordingly, for the reasons discussed in the Request, and for the reasons discussed above, the proposed rejection of claim 11 as being obvious over Ohno, Speronello, and Tennison should be adopted.

**IX. Grounds 11-13- Proposed Rejection of Claims 1, 2, 7, 8 and 10-15 as being obvious over Nakanishi in view of Tennison, of Claims 3-6 as being obvious over Nakanishi in view of Tennison and Speronello and of Claim 9 as being obvious over Nakanishi in view of Tennison and Chapman**

Pages 17-18 of the Office Action state that the proposed rejection of claims 1, 2, 7, 8, and 10-15 over Nakanishi in view of Tennison, the proposed rejection of claims 3-6 as being obvious over Nakanishi in view of Tennison and Speronello, and the proposed rejection of claim 9 as being obvious over Nakanishi in view of Tennison and Chapman, are not adopted. The Office Action reasons that Nakanishi teaches a catalyst that filters out soot, not an SCR catalyst that converts NO<sub>x</sub> to nitrogen. Along these lines, the Office Action asserts that Nakanishi and U.S. Patent No. 6,928,806 (Tennison) demonstrate that platinum is normally associated with soot

filtration, not NOx reduction. The Office Action also asserts there is no teaching, suggestion, or motivation that the presence of platinum in the filter of Nakanishi constitutes an SCR catalyst.

Contrary to the assertion in the Office Action, however, one of ordinary skill in the art would have readily appreciated that platinum is an SCR catalyst for the reduction of NOx. Walker Decl. (C), ¶6. Prior art evidences this understanding of the SCR catalyst nature of platinum. For example, U.S. Patent No. 2,975,025 (Cohn) teaches that a supported platinum group metal-containing catalyst can effect the selective removal of oxides of nitrogen from waste or tail gases using ammonia as a reductant. Cohn, col. 2, ll. 13-21. As another example, Heck teaches the use of a platinum catalyst for SCR of NOx with ammonia at low temperatures. Heck, Section 8.10 on pp. 204-05. Even if platinum can also be used to catalyze soot reduction, it does not follow that platinum was not known in the art as an SCR catalyst that reduces NOx. The Walker Declaration, Cohn and Heck unquestionably demonstrate that one of ordinary skill in the art would, in fact, have understood the platinum in Nakanishi to be an SCR catalyst for the reduction of NOx. Further, nothing in Nakanishi suggests that the platinum catalyst included with the disclosed filter would not act as an SCR catalyst.

It should also be noted that Nakanishi need not expressly disclose the SCR catalyst properties of platinum to anticipate the claimed SCR catalyst features. It is well established that a prior art reference may anticipate without disclosing a feature of the claimed invention if that missing characteristic is necessarily present, or inherent, in the single anticipating reference. *See, e.g., Schering Corp. v. Geneva Pharmaceuticals, Inc.*, 339 F.3d 1373, 1380 (Fed. Cir. 2003). In this case, Nakanishi expressly discloses a platinum catalyst. Nakanishi, para. (0014) on p. 3, Working Example 1 on p. 4. Further, nothing in Nakanishi suggests that the platinum catalyst included with the disclosed filter would not act as an SCR catalyst. Thus, by disclosing a platinum catalyst, Nakanishi anticipates the claimed SCR catalyst.

Accordingly, for the reasons discussed in the Request, and for the reasons discussed above, the proposed rejection of claims 1, 2, 7, 8, and 10-15 over Nakanishi in view of Tennison, the proposed rejection of claims 3-6 as being obvious over Nakanishi in view of Tennison and Speronello, and the proposed rejection of claim 9 as being obvious over Nakanishi in view of Tennison and Chapman, should be adopted.

X. **Grounds 14-16- Proposed Rejection of Claims 1, 2, 7, 8, and 10-15 as being obvious over Araki in view of Heck and Tennison, of Claims 3-6 as being obvious over Araki in view of Heck, Tennison and Speronello and of Claim 9 as being obvious over Araki, Heck, Tennison, and Chapman**

Pages 18-20 of the Office Action state that the proposed rejection of claims 1, 2, 7, 8, and 10-15 over Araki in view of Heck and Tennison, the proposed rejection of claims 3-6 as being obvious over Araki in view of Heck, Tennison, and Speronello, and the proposed rejection of claim 9 as being obvious over Araki, Heck, Tennison, and Chapman, are not adopted.

The Office Action finds that Araki discloses a NOx absorber that functions to absorb NOx at low temperatures, while releasing NOx at higher temperatures in order to accelerate the burning of particulate soot. The Office Action further finds replacing the NOx absorber of Araki with the SCR catalyst disclosed by Heck would result in NOx being converted to nitrogen and water, and that the SCR catalyst would not accelerate the burning of particles at higher temperatures. Thus, the Office Action concludes that the substitution of the SCR catalyst of Heck for the NOx absorber of Araki would change “the principle operation” of Araki. At page 12, the Office Action also asserts that as Speronello teaches an SCR catalyst, one of ordinary skill in the art would not look to concentrations of SCR catalyst as guidance to the concentration of soot catalyst disclosed by Araki.

The Office Action’s reasoning and conclusion with respect to the combination of Araki and Heck fails to consider the full disclosures of Araki and Heck. In discussing the NOx releasing feature of the NOx absorbing material, Araki indicates that the material absorbs NOx at low temperatures of about 250 °C, but releases the NOx as the temperature rises, with 350 °C as a peak. Araki, col. 7, ll. 26-28. Araki further indicates that as the temperature rises and exceeds, for example, 400 °C, the particulates burn on the filter. *Id.* at col. 7, ll. 33-36. Heck discloses SCR catalysts that are congruent with NOx absorbing temperature and NOx release and burn temperatures indicated in Araki. Specifically, Heck teaches that platinum can catalyze reduction of NOx at temperatures below about 200 °C, and vanadium oxide (V<sub>2</sub>O<sub>5</sub>) can catalyze reduction of NOx at temperatures in the range of 200 to 300 °C. Heck, Section 8.10.2 at pp. 205-206. Thus, in addition to teaching the alternative nature of NOx-absorbing materials (“NOx traps”) and SCR of NOx, Heck teaches SCR catalysts that are operable at specific temperature ranges. One of ordinary skill in the art looking to preserve the ability of the filter of Araki to use NOx to accelerate the burning of particulate soot at higher temperatures could have simply used the

lower temperature SCR catalysts taught by Heck, *i.e.*, the platinum and/or vanadium oxide catalysts that catalyze the reduction of NO<sub>x</sub> at lower temperatures. At higher temperatures, the NO<sub>x</sub> would not have been reduced, and thus, available to accelerate the burning of particulate soot. Thus, the Office Action is incorrect in concluding that the substitution of the SCR catalyst of Heck for the NO<sub>x</sub> absorber of Araki would change “the principle operation” of Araki.

Accordingly, for the reasons discussed in the Request, and for the reasons discussed above, the proposed rejection of claims 1, 2, 7, 8, and 10-15 over Araki in view of Heck and Tennison, the proposed rejection of claims 3-6 as being obvious over Araki in view of Heck, Tennison, and Speronello, and the proposed rejection of claim 9 as being obvious over Araki, Heck, Tennison, and Chapman, should be adopted.

**XI. Grounds 17-19- Proposed Rejection of Claims 1, 2, 7, 8 and 10-15 as being obvious over Pfeifer in view of Nakanishi and Tennison, of Claims 3-6 as being obvious over Pfeifer in view of Nakanishi, Tennison and Speronello and of Claim 9 as being obvious over Pfeifer in view of Nakanishi, Tennison and Chapman**

Pages 20-22 of the Office Action state that the proposed rejection of claims 1, 2, 7, 8, and 10-15 as being obvious over Pfeifer in view of Nakanishi and Tennison, the proposed rejection of claims 3-6 as being obvious over Pfeifer in view of Nakanishi, Tennison, and Speronello, and the proposed rejection of claim 9 as being obvious over Pfeifer in view of Nakanishi, Tennison, and Chapman, are not adopted. In this regard, the Office Action characterizes Pfeifer as teaching an SCR catalyst, and the Office Action asserts that Nakanishi is directed to a filter that includes a catalyst for removal of soot, not an SCR catalyst that converts NO<sub>x</sub> to nitrogen. The Office Action concludes that one of ordinary skill in the art would not look to modify the filter of Pfeifer using the teaching of Nakanishi.

Initially, the Office Action is incorrect in its implicit assertion that Pfeifer is solely directed to filter that includes an SCR catalyst for NO<sub>x</sub> reduction. Pfeifer teaches that the filter may also include catalysts for oxidation of hydrocarbons, *i.e.*, the removal of soot. Pfeifer, paras. [0046]-[0048]. In fact, Pfeifer expressly teaches that the filter may include catalysts, such as “HC-DeNO<sub>x</sub>” catalysts, for the simultaneous reduction of NO<sub>x</sub> as well as the oxidation of hydrocarbons. *Id.* Thus, Pfeifer clearly establishes that a filter having a catalyst for SCR of NO<sub>x</sub> is not mutually exclusive from a filter having catalyst for soot removal. And it follows that one of ordinary skill in the art would look to the wall flow filter of Nakanishi for guidance on the application of catalyst to the wall flow filter of Pfeifer.

Nakanishi is cited in the proposed rejection for teaching from its working examples the wall porosity and pore size that may be used to produce a wall flow filter that avoids significant back pressure. Request, pp. 32-33. The fact that Nakanishi discloses a soot reduction catalyst would not have dissuaded a skilled artisan from considering the reference's technique (washcoat loading of a high porosity filter, *see* para. (0021)) for applying other types of catalysts to a wall flow monolith. Walker Decl. (C), ¶8. The function of the catalyst is not relevant as the catalyst loading technique of Nakanishi would have been considered applicable for any type of washcoat catalyst, including SCR catalysts. *Id.* Instead, one of ordinary skill in the art would have understood that porosity of the filter and particle size of the washcoat composition were the key parameters in loading the filter without blocking the pores. Nakanishi, para. (0007); Walker Decl. (C), ¶8. Therefore, one of ordinary skill would have considered the washcoat technique of Nakanishi on a high porosity wall flow filter to be relevant for loading an SCR catalyst, as the use of the high porosity wall flow filter was considered for multiple types of catalytic washcoats. Walker Decl. (C), ¶8. Thus, a person of ordinary skill would have recognized that Nakanishi discloses a standard technique for applying amounts of washcoat catalyst composition to a high porosity wall flow monolith such as that disclosed by Pfeifer, regardless of the particular type or function of the catalyst disclosed in the Nakanishi. *Id.*

Thus, Nakanishi teaches an amount of catalyst that can be applied to a wall flow filter regardless of the particular catalyst, and one of ordinary skill in the art would consider this teaching as applicable to the wall flow filter of Pfeifer. The Office Action is incorrect in concluding that one of ordinary skill in the art would not look to modify the filter of Pfeifer using the teaching of Nakanishi.

Accordingly, for the reasons discussed in the Request, and for the reasons discussed above, the proposed rejection of claims 1, 2, 7, 8, and 10-15 as being obvious over Pfeifer in view of Nakanishi and Tennison, the proposed rejection of claims 3-6 as being obvious over Pfeifer in view of Nakanishi, Tennison, and Speronello, and the proposed rejection of claim 9 as being obvious over Pfeifer in view of Nakanishi, Tennison, and Chapman, should be adopted.

### CONCLUSION

For the above-discussed reasons, Requester submits that the rejections discussed above of claims 1-15 should be maintained and the proposed rejections of claims 1-15 that were not

previously adopted should be adopted. Further, Requester submits that the newly proposed rejections of claims 1-15 should be adopted.

In addition, the Requester traverses the Examiner's decision not to adopt all previously proposed rejections, for purposes of appeal.

These comments are accompanied by additional prior art that satisfies the requirements for the submission of prior art under 37 C.F.R. § 1.948(a)(2) or 37 C.F.R. § 1.948(a)(3). As described above, all the additional prior art is submitted to rebut a response of the Patent Owner or for the first time became known to Requester after the filing of the subject request for *inter partes* reexamination proceeding.

Requester's undersigned attorney may be reached in our New York office by telephone at (212) 218-2100. All correspondence intended to be sent to the Requester should be directed to the address listed below.

Respectfully submitted,

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Attachments:

- Hashimoto, S. et al., "SiC and Cordierite Diesel Particulate Filters Designed for Low Pressure Drop and Catalyzed, Uncatalyzed Systems," SAE Technical Paper Series, 2002-01-0322 (Mar. 2002)
- Heck, R.M. et al., "Catalytic Air Pollution Control," pp. 5, 6, 18 (2d ed. 2002)
- Plummer, Jr., H.K. et al., "Measurement of Automotive Catalyst Washcoat Loading Parameters by Microscopy Techniques," 5 Microsc. Microanal., 267-281 (1999)
- U.S. Patent Application Pub. No. 2003/0040425
- U.S. Patent Application Pub. No. 20020108367
- Declaration of Gary L. Haller, Ph.D. Under 37 C.F.R. § 1.132, filed in Reexamination Control No. 95/001,744 for U.S. Patent No. 7,902,107
- Blakeman Declaration (A)
- Phillips Declaration (B)
- Walker Declaration (C)
- Certificate of Service