IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In *Inter Partes* Reexamination of: PATCHETT ET AL.	Examiner: LOPEZ, CARLOS N.
Reexamination Control No. 95/001,744	Group Art Unit: 3991
Patent No. 7,902,107	Confirmation No: 4832
Issued: March 8, 2011	
For: CATALYZED SCR FILTER AND EMISSION TREATMENT SYSTEM	

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DECLARATION OF JOSEPH C. DETTLING UNDER 37 C.F.R. § 1.132

I, Joseph C. Dettling, hereby declare that:

1. I understand that claims 1-21, 23-34 and 36 are pending in the above-identified reexamination of Patent No. 7,902,107 ("the '107 Patent").

2. I am a co-inventor of the claimed subject matter in the '107 Patent.

3. I have a B.S. in Chemistry from St. Francis College and a M.S. in Chemistry from Long Island University. I worked for 44 years at BASF Corporation, the successor in interest to Engelhard Corporation, in the areas of research and development of heterogeneous catalysts for automotive applications, including diesel applications

4. Over the course of my 44 year career, my projects included surface characterization of catalysts/supports, and the thermal stabilization of alumina supports. I was responsible for the development of many of the Engelhard precious metal monolithic and particulate catalysts used in environmental processes for the oxidation of carbon monoxide and hydrocarbons, and the reduction of nitrogen oxides within three-way catalyst for the simultaneous conversion of all

three components near stoichiometric conditions. My research also was directed to catalysts for both gasoline and diesel passenger cars/trucks and numerous small engine applications. I held the positions of Manager of Automotive Catalysts and Manager of Catalyst Synthesis and Engine Testing. Prior to my retirement, I was promoted to Research Fellow, where I lead initiatives on the research and development of diesel particulate filters and selective catalytic reduction catalyst development.

5. I was part of a team that dramatically improved the efficiency of the automotive catalyst manufacturing plant. As the Catalyst Preparation Section Head, I also led a group to create a new more robust and precise manufacturing process for the manufacture of automotive catalysts throughout the company supply chain which resulted in patents on state-of-the-art equipment and revolutionary catalyst designs that made Engelhard a worldwide environmental catalyst technology leader.

6. I am a named inventor on 62 United States patents relating to catalysts and their application, many of which pertain to automotive and diesel catalysts. I have co-authored 24 worldwide publications in the area of automotive and diesel catalysis. In 1998, the Engelhard technical team that I led was recognized for a Pd only TWC catalyst that resulted in our induction into the New Jersey Hall of Fame. This was followed by BASF technical teams under my supervision that were recognized with the Thomas Alva Edison Patent Award in 2010 and 2011 for work conducted in the area of SCR catalysis.

7. Patent owner's counsel has provided and I have reviewed the '107 patent and amendments made thereto, the Request for Reexamination dated February 15, 2012 ("the Request for Reexamination"), the Office Action mailed May 9, 2012 ("the Office Action"), and the references cited in the Office Action. I have also reviewed the Action Closing Prosecution mailed May 3, 2012 in Reexamination Control No. 95/001,744 ("the ACP in the '744 Reexamination"), as well as the references cited therein. I have also reviewed references cited in this Declaration. I have also reviewed the submissions of the Third Party Requester in this matter, including the Declarations of Dr. Phillips, Dr. Blakeman and Dr. Walker.

8. I understand that when amended claim 1 of the '107 Patent will recite:

1. A catalyst article consisting essentially of a wall flow monolith and catalytic material, wherein the wall flow monolith has a plurality of longitudinally extending passages formed by longitudinally extending walls bounding and defining said passages, wherein the passages comprise inlet passages having an open inlet end and a closed outlet end, and outlet passages having a closed inlet end and an open outlet end, and the wall flow monolith contains catalytic material comprising a slurry loaded washcoat of an SCR catalyst composition including a zeolite and a base metal component that permeates the walls at a loading up to 2.4 g/in^{3}effective to convert a NOx component to nitrogen through selective catalytic reduction with ammonia.

9. I understand that when amended claim 18 will recite:

18. A catalyst article consisting essentially of a wall flow monolith and catalytic material, wherein the wall flow monolith has a plurality of longitudinally extending passages formed by longitudinally extending walls bounding and defining said passages, wherein the passages comprise inlet passages having an open inlet end and a closed outlet end, and outlet passages having a closed inlet end and an open outlet end, wherein the wall flow monolith contains the catalyst material comprising a slurry loaded washcoat of an SCR catalyst composition including a zeolite and a base metal component that permeates the walls at a concentration of at least 1.3 g/in^3 effective to convert a NOx component to nitrogen through selective catalytic reduction with ammonia; wherein the wall flow monolith has a wall porosity of at least 50% with an average pore size of at least 5 microns.

10. I understand that when amended claim 21 will recite:

21. A catalyst article consisting essentially of a wall flow monolith and catalytic material, wherein the wall flow monolith has a plurality of longitudinally extending passages formed by longitudinally extending walls bounding and defining said passages, wherein the passages comprise inlet passages having an open inlet end and a closed outlet end, and outlet passages having a closed inlet end and an open outlet end, and the wall flow monolith contains the catalytic material comprising a slurry loaded washcoat of an SCR catalyst composition that permeates the walls effective to convert a NOx component to nitrogen through selective catalytic reduction with ammonia, wherein the wall flow monolith has a wall porosity of at least 50% with an average pore size of at least 5 microns.

11. The '107 Patent is directed to a catalytic article that provides four integral properties: (1) filtration of soot from the exhaust gas stream of a diesel engine at a high filtration efficiency; (2) conversion of a NO_x component to nitrogen through selective catalytic reduction with ammonia

by the proper loading of a SCR catalyst composition that permeates the walls of a wall flow filter, which also (3) lowers the soot burning temperature of soot collected on the wall flow filter; (4) without increasing the backpressure to an unacceptable level. It is improper to view the claimed invention by one or more of these properties without including all four of these functions provided by the claimed invention.

12. To properly understand the subject matter of the '107 Patent, a person of skill in the art should have a background in heterogeneous catalysts, as well as experience with engine catalysts, including catalyzed diesel filters and catalysts for the selective catalytic reduction of nitrogen oxides. A person of ordinary skill in the art should have at least a Master's degree in chemistry, chemical engineering, or materials science, as well as research or manufacturing experience with heterogeneous catalysts for oxidation and reduction reactions of pollutants in diesel engine exhaust.

Development of the '107 Patent Subject Matter

13. Prior to the invention which is the subject of the '107 Patent, there was no demonstration or even consideration in the industry of the introduction of SCR catalysts into large pore size, high porosity wall flow filters such that the SCR catalysts permeated the filter walls, resulting in a catalytic article that could properly function as an SCR catalyst, lower the soot burning temperature, without an undue increase in backpressure and providing adequate filtration efficiency. In addition, the conventional wisdom prior to the development work that led to the filing of the patent application for the instant invention in August 2003 was that larger pore size, higher porosity wall flow filters should be avoided. While Hashimoto et al., SAE Paper 2002-0100322 ("Hashimoto"), cited by the Requester raised the possibility of using higher porosity filters with non-SCR catalysts, practical considerations weighed against use of high porosity wall flow substrates and application of coating materials within the wall structure. There are several trade-offs to consider with respect to porosity and pore size, as these parameters affect pressure drop of the exhaust gas system, regeneration temperature, thermal cracking of the filter and system weight.

14. At the time of the invention, the conventional wisdom was to use substrates with very thick and dense, low porosity walls to provide a high thermal mass. Cordierite substrate and

diesel engine manufacturers, along with catalyst providers, were struggling with effects of uncontrolled filter regeneration on catalyzed and uncatalyzed filters alike. Because of these problems, manufacturers of ceramic wall flow substrates made of cordierite avoided high porosity substrates, and instead utilized denser and thicker walled structures that had lower porosity. This is evidenced in Hashimoto, cited in this action. In the Hashimoto paper, the standard cordierite filter is DCH-558, and newer SiC materials are presented. *See* Hashimoto paper at page 13. The absence of any filter regeneration data for a **catalyzed** soot filter in the Hashimoto paper provides little information or guidance to a person of skill in the art to make an informed choice on all of the critical and countervailing considerations in optimizing a catalyzed filter design in August 2003. Certainly, the authors of the Hashimoto paper recognized the need to study the "influence of porosity on the pressure-drop and filtration efficiency performance of **catalyzed** DPF." (emphasis added). Accordingly, the Hashimoto paper provides no guidance on how a catalyzed filter would perform in use in an actual engine, and more importantly, Hashimoto did not discuss loading the walls of the wall flow filter with an SCR catalyst comprising a zeolite and a base metal.

15. In the late 1990's and early 2000's, wall flow filter suppliers had cautioned Engelhard against going in the direction we proceeded—loading higher porosity, larger pore wall flow filters with catalyst material for the reasons mentioned above. The wall flow filter substrate suppliers were skeptical that a system with high porosity and large pores would have the proper filtration efficiency and have the material properties to withstand thermal cracking due to the lowered thermal mass. *See, e.g.* United States Patent No. 6,508,852 at col. 1, lines 45-52; assigned to substrate supplier Corning) (Exh. 1). With respect to the issue of thermal mass, in August 2003, the conventional wisdom of the time was to avoid coating materials within the wall structure. This was at least partly due to concerns that differences in chemistry and/or incompatibility the coefficient of thermal expansion between the washcoat and substrate would exaggerate the problem of melting or "ring-off" cracking in the substrate. *See*, for example, United States Patent number 5,089,237 (Exh. 2), which observes at column 1, lines, 60-64 that embedded particles in the filter wall can give rise to chemical reaction with the ceramic material making up the filter wall and changes in the material resulting from incompatibility between the substrate and washcoat. Moreover, it was our understanding that the manufacture of higher

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