

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In *Inter Partes* Reexamination of:)
BULL ET AL.)
Reexamination Control No. 95/001,453)
Patent No. 7,601,662)
Issued: October 13, 2009)
For: COPPER CHA)
ZEOLITE CATALYSTS)
Examiner: DIAMOND, ALAN D
Group Art Unit: 3991
Confirmation No: 2755

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DECLARATION OF AHMAD MOINI, PH.D., UNDER 37 C.F.R. § 1.132

I, Ahmad Moini, do declare and say as follows:

1. I am a Senior Research Associate for BASF Corporation, the successor in interest to Engelhard Corporation and BASF Catalysts LLC (BASF), the owner of United States patent number 7,601,662 ("the '662 patent"). I received a B.S. in Chemistry from Eastern Washington University in 1982 and a Ph.D. in Chemistry from Texas A&M University in 1986. I have been a scientist at BASF Corporation. I am a co-inventor of the subject matter described and claimed in the '662 patent.

2. I have been involved in heterogeneous catalyst research for more than 20 years, first as a researcher at Mobil Research and Development Corporation, and later at BASF Corporation. I am a named inventor on 30 granted United States patents, some of which pertain to zeolites for use as automotive catalysts.

3. As part of the research team that discovered the copper chabazite catalysts of the '662 patent, we were tasked with the challenge to provide a material for selective catalytic reduction that would have two main properties: (1) excellent NO_x conversion over a wide temperature range, including the low temperature range of 200° C to 350° C; and (2) hydrothermal stability—meaning that the NO_x conversion would not degrade significantly upon hydrothermal aging at temperatures in excess of 650° C. Before beginning research, I initially believed that a metal promoted zeolite would not have both of these properties. Prior to the invention of the subject matter of the '662 patent, it was believed that Fe zeolites had better hydrothermal stability than Cu zeolites.

4. Our initial studies included a small scale rapid screening test that we developed and used to initially screen over 900 zeolite materials including over twelve different structure types, different

silica to alumina ratios, different metal ions, and different metal ion/aluminum ratios. After initial studies were completed, selected samples were screened further on the basis of NO_x conversion, low degradation of NO_x conversion after hydrothermal aging at 800° C in 10% H₂O, and low generation of N₂O. The materials claimed in the '662 patent emerged as the lead material, and we found that zeolites having the CHA structure type and a silica to alumina ratio greater than 15 and copper to aluminum ratios exceeding 0.25 met the requirements stated above. I believe the properties of these materials were highly unexpected.

5. It is my understanding that the invention is not limited to zeolites containing free or non-exchanged copper. Examples 1, 1A, 2, 3, 4, 6, 7, 8, 9, 16, 17 and 18 all show the unexpected results achieved by zeolites that have the CHA structure type and silica to alumina ratio greater than 15 and copper to aluminum ratio exceeding 0.25. The properties of the examples tested were quite unexpected in that the literature had reported that Cu zeolites exhibited poor hydrothermal stability. There had been a longstanding need for a metal promoted zeolite that exhibited both low temperature conversion in the range of 200° to 350° C and hydrothermal stability. The Examples in the '662 patent include various copper loadings, variations in ion exchange techniques (e.g., concentration of exchange solution, temperature, time, number of exchanges, exchange prior/during/after formation/application of slurry, etc). A person of ordinary skill in the art will readily understand that these variations will affect NO_x conversion. Aside from these variations in preparation, the Examples show that when additional steps were taken beyond a traditional ion exchange, enhanced NO_x conversion was obtained. Comparing Examples 1A and 1, it is believed that the level of NO_x conversion for Example 1A was higher than Example 1 for the aged samples, because Example 1A included the addition of copper to the coating slurry after traditional ion exchange to provide additional copper. Example 3, which involved traditional ion exchange plus impregnation also showed enhanced NO_x conversion performance for aged samples compared to other aged samples.

6. Example 18 shows the effect of using different ion exchange conditions (e.g., copper acetate versus copper sulfate) on the performance of the catalyst. In Example 18, a relatively high concentration of copper acetate was used and the ion exchange was conducted at 70° C for one hour. Example 18 is a unique preparation.

7. A person of ordinary skill in the art could determine the presence of free or non-exchanged copper in each Example of the '662 patent from available techniques such as X-ray Absorption Near-Edge Structure spectroscopy.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made herein on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the above-identified patent.

Respectfully submitted,

Dated: February 9, 2011

By: Ahmad Moini
Ahmad Moini, Ph.D.