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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE
THE PATENT TRIAL AND APPEAL BOARD

Ex parte JGC CATALYSTS AND CHEMICALS LTD.
Inventor: Kazutaka Egami

Appeal 2011-005373
Application 11/798,821
Technology Center 1700

Before CHARLES F. WARREN, MARK NAGUMO, and CHRISTOPHER L. CRUMBLEY, *Administrative Patent Judges*.

NAGUMO, *Administrative Patent Judge*.

DECISION ON APPEAL

A. Introduction[1]

JGC Catalysts and Chemicals Ltd. ("JGC") timely appeals under 35 U.S.C. § 134(a) from the final rejection[2] of claims 7-16, 19, and 20, which are all of the pending claims. We have jurisdiction. 35 U.S.C. § 6. We REVERSE.

The subject matter on appeal relates to methods of producing an oxychlorination catalyst. Oxychlorination catalysts are used to chlorinate aliphatic hydrocarbons such as ethylene (C_2H_4) to produce, e.g., 1,2-dichloroethane (CH_2ClCH_2Cl, "EDC"). Typically, the oxychlorination reaction is conducted in a fluidized bed reactor. Catalysts that do not lose their fluidity (e.g., by migration of certain components to the surface of the catalyst particles), and that have high selectivity and activity for producing EDC, are desired. (Spec. 1 [0002].)

According to the 821 Specification, the present inventor previously disclosed, in "Patent document 5,"[3] an oxychlorination catalyst having high selectivity and activity, as well as suppressed lowering of fluidity, arising from the use of a pseudo-boehmite-alumina-slurry as the carrier for the

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[1] Application 11/798,821, *Oxychlorination Catalyst and Method for Preparing the Same*, filed 17 May 2007. The specification is referred to as the "821 Specification," and is cited as "Spec." The real party in interest is listed as JGC Catalysts and Chemicals Ltd. (Japan) (Appeal Brief, filed 7 September 2010 ("Br."), 2.)

[2] Office action mailed 1 April 2010.

[3] Kazutaka Egami and Susumu Fujii, *Method For Preparing Oxychlorination Catalyst And Oxychlorination Catalyst*, JP 2005-000730 A (2005) ("Egami").

catalyst. (Spec. 2 [0004].) The manufacture of this catalyst, however, is said to require the use of a large amount of chlorine, which tends to corrode the stainless steel apparatus. (*Id.*) "On the other hand," the Specification continues, "the activity, selectivity and fluidity of the catalyst are insufficient when an amount of halogen (chlorine) used as a raw material decreases, or when other acidic salt such as sulfate is used." (*Id.*)

The solution to this problem, for which patent protection is sought, is to use cupric nitrate, rather than cupric chloride, and nitric acid, rather than hydrochloric acid, as well as the nitrate salts of alkali, alkaline earth, and rare earth metals, rather than the halide (chloride) salts used by the prior art in oxychlorination catalysts.

Representative Claim 7 reads:

> A method of producing a catalyst for oxychlorination comprising alumina and copper, the method comprising the following steps (a) to (c):
>
> (a) preparing a slurry for spray-drying by adding, to a pseudo-boehmite alumina slurry,
>
> nitric acid in a range from 0.001 to 0.1 moles per mole of Al_2O_3 in the slurry, and
>
> an aqueous solution of cupric nitrate;
>
> (b) spray-drying the slurry; and
>
> (c) calcining particles obtained in the step (b),
>
> wherein a content of copper is in the range from 5 to 20% by weight calculated as CuO, and a *content of chlorine is 0.5% by weight or less*.

(Claims App., Br. 17; indentation, paragraphing, and emphasis added.)

Remaining independent claims 12 and 13 are similar to claim 1, but require the further presence of alkaline earth [Group 2] metal salts, rare earth

metal salts, and an alkaline [Group 1] salt, within specified concentration ranges. Both require that the content of chlorine is 0.5% by weight or less, and claim 13 further requires that chlorine is "substantially absent in the catalyst."[4]

The Examiner maintains the following ground of rejection:[5]

> Claims 7-16, 19, and 20 stand rejected under 35 U.S.C. § 103(a) in view of the combined teachings of Kramer[6] and Egami.[7]

B. Discussion

Findings of fact throughout this Opinion are supported by a preponderance of the evidence of record.

Initially, we find that, in the present posture of the case, JGC has not presented substantively distinct arguments for the separate patentability of any claims. Accordingly, all claims stand or fall with claim 7.

The Examiner finds that Kramer describes methods of making oxychlorination catalysts that meet all the limitations recited in the

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[4] We need not decide whether the dual chlorine recitations in claim 13 are redundant.

[5] Examiner's Answer mailed 9 November 2010 ("Ans.").

[6] Keith S. Kramer and Joseph A. Cowfer, *Catalyst Compositions and Process for Oxychlorination*, U.S. Patent Application Publication 2007/0112235 A1 (17 May 2007), based on an application filed 10 November 2006.

[7] *See* n.3, *supra*. We refer to the JPO machine translation in the record. The Examiner and Appellants refer to this reference as "Susumu," the given name of the second author.

independent claims but for the molar ratio range of acid to alumina slurry, and the use of pseudo-boehmite alumina. (Ans. 4, ll. 19-21). The Examiner finds that Egami describes oxychlorination catalysts with pseudo-boehmite alumina carriers and the use of acids, including nitric acid, in the required ratio to alumina, and argues that it would have been obvious to use those teachings in processes taught by Kramer. (*Id.* at 5.) The Examiner finds further that Kramer does not expressly describe the requirement that the chlorine content [of the catalyst] be 0.5% by weight or less. (*Id.* at 5, ll. 20-21.) However, "it would have been obvious," the Examiner argues, "that chlorine content being zero when using metal oxide or salt such as bromide, iodide, nitrate, bicarbonate, carbonate as taught by Kramer to provide a higher optimal temperature without sacrificing the performance benefits such as high EDC selectivity, high product purity, high HCl conversion and excellent fluidity." (*Id.* at 5, l. 21, to 6, l. 4.)

In JGC's view, the Examiner's reliance on Egami, which teaches the addition of cupric chloride, chloridation rare earth metal salts, and an alkali halide (Br. 7, ll. 4-10, quoting Egami [0006]) is incongruous with the subsequent argument that it would have been obvious to use only the alternative (non-chloride) salts mentioned by Kramer (*id.* at 8, ll. 14-18). JGC argues further that the rejection lacks any clearly articulated reason (*id.* at 6, l. 27) or any support (*id.* at 8, l. 24) for the conclusions that the advantages taught by Egami would be achieved with the proposed substitution into the processes taught by Kramer. In this regard, JGC submits that the inventor discovered that the claimed catalyst "surprisingly shows the same high activity and selectivity as those in the conventional

catalysts." (*Id.* at 9, ll. 26-28.) Moreover, according to JGC, the nitric acid, in addition to providing a non-corrosive process of producing the catalyst, provides homogenized aggregated particles and a catalyst with high abrasion resistance. (*Id.* at 10, ll. 20-25.) Finally, JGC argues that there is no evidence of record indicating that "the cited references remotely considers the corrosive problem that is addressed in this application." (*Id.* at 11, ll. 8-10.)

The weight of the evidence supports JGC. At best, the combined teachings of Kramer and Egami might have suggested that it might be obvious to try coprecipitating cupric nitrate, rather than cupric chloride, in nitric acid, rather than in hydrochloric acid, with rare earth nitrates, alkaline earth nitrates, and alkali nitrates, or non-chloride salts, onto pseudo-boehmite alumina slurries, with a reasonable expectation of achieving an oxychlorination catalyst. To this extent, a minimal prima facie case of obviousness might be said to have been established. However, as JGC argues, the Examiner has not directed our attention to any credible evidence that the benefits taught by Egami for the particular catalysts resulting from the particular processes taught would have been expected to apply to any catalyst formed on the disclosed pseudo-boehmite carriers. Similarly, the Examiner has not directed our attention to any data suggesting that low-chlorine-content oxychlorination catalysts would have been expected to perform comparably to the chlorinated catalysts described by Egami. Indeed, the Examiner has not directed our attention to any oxychlorination catalysts prepared with low amounts of chloride salts, and the express preference of both Kramer and Egami for chlorides suggests that non-

chloride salts are not as highly regarded by those skilled in the art. Moreover, the mechanisms of heterogeneous catalysis reactions are generally regarded as being poorly understood, and thus, relatively unpredictable. Thus, a minimal showing of unpredictability in the art would suffice to demonstrate failure to establish a prima facie case of obviousness, or a minimal showing of unexpected results would suffice to rebut the rejection of record, taken as a prima facie case of obviousness.

As has often been observed, especially in the area of "improvement" inventions, it is rare that those skilled in the art would not have recognized the possibility that the invented improvement would work. Because enablement is not an issue, evidence of enablement is not probative of obviousness. In such cases, the existence or not of evidence of practical reasons to pursue an embodiment within the scope of the claimed invention is often the strongest evidence of obviousness or non-obviousness. Here, the absence of practical reasons for a person having ordinary skill in the art to select catalyst components in which every preferred compound is substituted by some non-preferred alternative establishes, at best, a very weak case of prima facie obviousness.

A showing of unpredictability or of unexpected results is provided by the data presented in Tables 1 through 3 at page 28 of the 821 Specification. These data show that Examples 1 through 4 of the claimed catalysts have at least comparable selectivity, activity, abrasion resistance as Comparative Examples 1 and 2 (the chlorinated catalysts), and that the inventive Examples have fluidity superior to catalysts prepared from aqueous HCl slurries of pseudo-boehmite carriers during the oxychlorination reaction.

The Examiner has not directed our attention to evidence indicating that these results would have been expected.

We conclude that the preponderance of the evidence supports JGC's arguments that the rejections of record should be REVERSED.

C. Order

We REVERSE the rejection of claims 7-16, 19, and 20 under 35 U.S.C. § 103(a) in view of the combined teachings of Kramer and Egami.

REVERSED

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