

The opinion in support of the decision being entered today was *not* written for publication and is *not* binding precedent of the Board.

**UNITED STATES PATENT AND TRADEMARK OFFICE**

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**BEFORE THE BOARD OF PATENT APPEALS  
AND INTERFERENCES**

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*Ex parte* CHARLES E. SKINNER, YUNG K. KIM,  
and WILLIAM H. CAMPBELL

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Appeal No. 2006-2710  
Application No. 10/458,114  
Technology Center 1700

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**ON BRIEF**

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Before ADAMS, GRIMES, and LEBOVITZ, *Administrative Patent Judges*.  
GRIMES, *Administrative Patent Judge*.

**DECISION ON APPEAL**

This appeal involves a claim to an alkylated amine functional macromolecule. The Examiner has rejected this claim as obvious. We have jurisdiction under 35 U.S.C. § 134. We affirm.

**BACKGROUND**

Macromolecules include dendrimers and hyperbranched polymers. “Dendrimers are . . . globular, nano-scale macromolecules consisting of two or more tree-like dendrons, emanating from a single central atom or atomic

group called the core.” (Specification 1.) “Dendrons are the smallest constitutive elements of a dendrimer that have the same architectural arrangement as the dendrimer itself, but which emanate from a single trunk or branch.” (*Id.*) “[H]yperbranched polymers are random, highly branched macromolecules usually obtained from a ‘one-shot’ polymerization reaction of an AB<sub>w</sub> type of monomer, that is nAB<sub>w</sub>→----(AB<sub>w</sub>)<sub>n</sub>-----, where A and B represent mutually reactive functional groups of the monomer.” (*Id.* at 2.) “Multi-layered macromolecules” have a base macromolecule that is a dendrimer or a hyperbranched polymer with additional layers of macromolecules chemically bonded to the base macromolecule, the additional layers of macromolecules being dendrimers, hyperbranched polymers, or combinations of them. (*Id.*)

The specification describes “an alkylated amine functional macromolecule comprising a base macromolecule covalently bonded to a solid substrate wherein the base macromolecule is selected from the group consisting of amine functional (a) dendrimers, (b) hyperbranched polymers, (c) multilayered dendrimers, (d) multilayered, hyperbranched polymers, (e) multilayered polymers of mixed dendrimer, and hyperbranched multilayers. The amine functionality of the macromolecule is further modified to provide alkylated amine functionality.” (*Id.* at 5.)

The specification states that silane bonding agents may be used to bond the macromolecules to the substrate. (*Id.* at 2.) “[S]ilane bonding agents . . . are any functional silane that comprises a hydrolyzable leaving group that allows the reaction of the silane bonding agent with the solid

substrate, . . . which silanes also contain a reactive group capable of reacting with the functional groups of the macromolecules.” (*Id.* at 11-12.)

The specification also states that the “solid substrates . . . are any solid substrates that will bond to a silane bonding agent of this invention, for example, films, membranes, and particulate mineral materials, including silica, that provide a stable –SiO- bond when bound to a silane bonding agent.” (*Id.* at 11.)

## DISCUSSION

### 1. CLAIM CONSTRUCTION

Claim 1 is on appeal. Claims 2-57 are also pending but have been withdrawn from consideration by the Examiner.

Claim 1 reads as follows:

An alkylated amine functional macromolecule comprising a base macromolecule covalently bonded by a silane bonding agent to a solid substrate wherein the base macromolecule is selected from the group consisting of amine functional:

- (a) dendrimers,
- (b) hyperbranched polymers,
- (c) multilayered dendrimers,
- (d) multilayered hyperbranched polymers
- (e) multilayered polymers of mixed dendrimer, and,  
hyperbranched multilayers.

Thus, claim 1 is directed to an alkylated amine functional macromolecule that is covalently bonded by a silane bonding agent to a solid substrate. The macromolecule can be, among other things, a dendrimer.

## 2. OBVIOUSNESS

Claim 1 stands rejected under 35 U.S.C. § 103 as obvious over Neumann<sup>1</sup> in view of Snyder.<sup>2</sup> The Examiner states that, “[a]t best, the claim differs from Neumann . . . in reciting use of a silane bonding agent.” (Answer 3.) The Examiner argues that it “would have been obvious to use a silane bonding agent in Neumann . . . because Snyder . . . discloses that siloxanes are the most useful and most widely available bonded phase chromatography packings and are hydrolytically stable.” (*Id.*)

In particular, the Examiner argues that Neumann “is not particular as to how the dendrimer is bonded to the substrate. . . . A fair reading of . . . Neumann . . . indicates that use of a triazine is one of many bonding methods and Neumann . . . is not limited to triazine.” (Answer 3-4.) In addition, the Examiner argues that Neumann “specifically indicates that the dendrimer could be first formed and then bonded to the substrate or built on the substrate itself.” (Answer 4 (citing Neumann, p. 4, l. 20, to p. 5, l. 4).)

Furthermore, the Examiner argues that Neumann discloses that “the dendrimers are ‘functionalized by appropriate groups’ including ‘alkyl having 1-20 C atoms.’ As such, Neumann[ ]’s dendrimers are disclosed to be alkylated. Alkylating a polymelamine dendrimer forms an alkylated amine functional macromolecule.” (Answer 4-5 (citing Neumann, p. 3, ll. 32-34, and p. 9, claims 1-4).)

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<sup>1</sup> Neumann-Rodekirch et al., German Patent Publication No. DE 196 21 741 A1, published December 4, 1997. The citations are to the English-language translation of record.

<sup>2</sup> Snyder, *Introduction to Modern Liquid Chromatography* 272-275 (John Wiley & Sons, Inc. 1979).

We conclude that the Examiner has set forth a *prima facie* case of obviousness. Neumann describes a stationary phase for chromatography that is modified to include a large number of functional groups. “The goal is achieved by modifying the stationary phase by means of chemically bound dendrimers or dendrones.” (Neumann 1-2.) As the stationary phase, Neumann describes silica gels. (*Id.*)

Neumann states that the preferred dendrimers are poly(melamine)-dendrimers. (*Id.* at 3.) In addition, Neumann discloses that “the dendrimers or dendrones are functionalized by appropriate groups, in particular . . . NR<sup>2</sup>R<sup>3</sup>, where . . . R<sub>2</sub> [sic, R<sup>2</sup>] and R<sup>3</sup>, which may be identical or different, denote H, [or] optionally substituted alkyl having 1-20 C atoms. . . .” (*Id.* at 3-4.) Thus, we conclude that the Examiner has set forth a *prima facie* case that Neumann describes alkylated amine dendritic materials that are chemically bound to a solid substrate.

Snyder describes preparing chromatography packings by attaching a bonded phase to a siliceous support via surface silanol groups. (Snyder 272.) Snyder teaches that “the most useful and most widely available BPC [bonded phase chromatography] packings are those based on siloxanes,” which are typically “prepared by reacting the silanol groups of the support with organochlorosilane or organoalkoxysilane reagents (depending on the R group desired),” and that “[b]onded phases of this type are hydrolytically stable.” (Snyder 273. *See also*, Snyder Fig. 7.1(c).) Thus, Snyder describes using an organosilane compound as the means for attaching an organic group to a silica support. Based on this teaching, we conclude that the Examiner has set forth a *prima facie* case that, in order to form the highly

functionalized stationary phase described in Neumann, it would have been obvious to use a silane bonding agent as the means for attaching a dendrimer to a silica support.

Appellants argue that “Neumann binds polymers using organic binding agents, namely, triazine, which is a trifunctional molecule wherein all of the nitrogen atoms are functional and active. This fact in itself dictates that the Neumann materials are different and do not make the materials of the instant invention obvious.” (Br. 3.) Appellants also argue that “the processes as taught in Snyder do not . . . teach binding dendritic materials to solid substrates.” (Br. 4.)

We do not find these arguments persuasive. The Examiner is not relying on either Neumann or Snyder to individually teach or suggest all of the features of claim 1. Instead, the Examiner is arguing that the combination of these two references renders claim 1 obvious. We conclude that the Appellants have not overcome the Examiner’s *prima facie* case that the combination of Neumann with Snyder renders claim 1 obvious.

Appellants argue that “Neumann necessarily needs to modify the solid substrate so that the triazine can be used therein, by treating the substrate with an amino compound. This leads to materials that are created by at least a two step process just to create the amino functional polymer, and the resulting materials are crosslinked, whereas the materials of the instant invention are not.” (Br. 3.) In addition, Appellants argue that “Neumann treats the solid substrate with his bonding agents, and then builds the dendritic polymer onto that surface, while the process of the instant invention merely bonds already formed bulky dendrimers to solid substrates

and, in addition, alkylates the dendrimers while bound to the solid substrate.” (Br. 4.) Appellants argue that the “Neumann process leads to materials that are randomly structured, are unstable, and [are] difficult to manufacture.” (*Id.*)

Contrary to the arguments raised by Appellants, Neumann describes coupling a finished dendrimer to the stationary phase. (Neumann 4.) In addition, although “Neumann states that “a silica gel functionalized with -NH<sub>2</sub> is particularly suitable for the use of poly(melamine)dendrimers” (*id.*), Neumann does not require that the stationary phase be treated with an amino compound, or even that a triazine be used to bind the dendrimer to the stationary phase. More importantly, Appellants have not demonstrated that the processes described in Neumann, modified to attach the dendrimer using an organosilane, would not result in the product recited in claim 1. The “patentability of a claim to a *product* does not rest merely on a difference in the method by which that product is made. Rather, it is the product itself which must be new and unobvious.” *In re Pilkington*, 411 F.2d 1345, 1348, 162 USPQ 145, 147 (CCPA 1969) (emphasis in original).

Appellants also argue that “the materials of the instant invention are alkylated dendritic materials while the materials of Neumann are not. Still further, to arrive at the alkylated materials of this invention one has to treat the bound dendritic materials with yet another step, which is not found in, nor suggested by Neumann, that is, a step for alkylation of the dendritic materials.” (Br. 4.) However, for the reasons discussed above, we conclude that the Examiner has set forth a prima facie case that Neumann describes

alkylated dendritic materials. In particular, Neumann describes dendrimers functionalized by alkyl amines. (Neumann 3-4.)

In addition, Appellants argue that:

Snyder teaches chromatography end uses. The major end use of the materials of the instant invention is for scavenging metals from solution, and in cosmetics. None of these end uses, and the knowledge that the alkylated amine functional dendritic molecules of this invention would have the properties to do this kind of activity, are set forth or obvious from Snyder. Why would it be obvious, then, from a combination of the two references, to bind the amine functional dendritic material to a solid substrate, and then alkylate it?

(Br. 4.) However, the Examiner is not relying on Snyder to provide motivation to “bind the amine functional dendritic material to a solid substrate, and then alkylate it.” Instead, the Examiner is relying on Neumann to disclose these features of claim 1. The Examiner is merely relying on Snyder to disclose using an organosilane to attach an organic group to a silica support. For the reasons discussed above, we conclude that Neumann discloses chemically bonding an alkyl amine dendrimer to a solid support, and that, based on the teachings of Snyder, one of ordinary skill in the art would have been motivated to use an organosilane to attach the dendrimer to the support.

## SUMMARY

The Examiner has set forth a prima facie case that claim 1 would have been obvious over Neumann in view of Snyder, and Appellants have not rebutted this prima facie case. We therefore affirm the rejection of claim 1 under 35 U.S.C. § 103.

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No time period for taking any subsequent action in connection with this appeal may be extended under 37 CFR § 1.136(a).

AFFIRMED

Donald E. Adams )  
Administrative Patent Judge )  
                        )  
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                        )  
                        ) BOARD OF PATENT  
Eric B. Grimes      )  
Administrative Patent Judge ) APPEALS AND  
                        )  
                        ) INTERFERENCES  
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Richard M. Lebovitz )  
Administrative Patent Judge )

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