

THIS OPINION WAS NOT WRITTEN FOR PUBLICATION

The opinion in support of the decision being entered today (1) was not written for publication in a law journal and (2) is not binding precedent of the Board.

Paper No. 30

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte ROBERT B. WARDLE and W. WAYNE EDWARDS

Appeal No. 1996-1529
Application No. 08/233,219¹

HEARD: October 19, 1999

Before WARREN, WALTZ, and SPIEGEL, *Administrative Patent Judges*.
SPIEGEL, *Administrative Patent Judge*.

DECISION ON APPEAL

This is a decision on appeal under 35 U.S.C. § 134 from the examiner's final rejection of claims 6 through 11 and 13 through 19, which are all of the claims pending in this application.

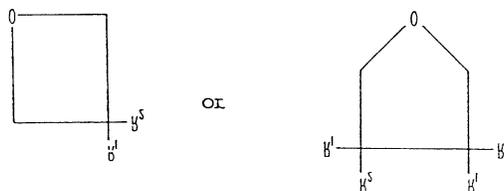
Claims 6 and 17 are illustrative:

6. A method of rapidly producing an energetic cyclic ether polymer having

¹ Application for patent filed April 26, 1994. According to appellants, this application is a continuation of Application 07/880,536, filed May 8, 1992, now abandoned.

controlled
molecular
comprising the

cyclic
the
formula



functionality and
weight,
steps of:
obtaining a quantity of
ether monomer having

wherein the R_1 and R_2 groups are the same or different and are selected from the group consisting of moieties having the formula $-(CH_2)_nX$, where n is an integer from 0 to 10 and X is selected from the group consisting of $-N_3$, $-H$, $-ONO_2$, $-Cl$, $-CN$, $-Br$, and $-O(alkyl)$, wherein alkyl is C_1-C_{16} , branched or unbranched, cyclic or acyclic;

obtaining a co-catalytically effective quantity of a triethoxonium salt which is capable of acting as a co-catalyst of a polymerization reaction of said cyclic ether monomer;

obtaining a co-catalytically effective quantity of an alcohol which is capable of acting as a co-catalyst of a polymerization reaction of said cyclic ether monomer;

combining said salt and said alcohol to form a polymerization catalyst mixture;

adding said cyclic ether to the mixture of said salt and said alcohol in a non-polar solvent and allowing polymerization of said cyclic ether to occur and allowing said salt to scavenge trace water contained within said mixture such that a polymer of controlled functionality is rapidly produced.

17. An energetic polymer produced by the following method:

obtaining a quantity of cyclic ether monomer having the formula

wherein the R_1 and R_2 groups are the same or different and are selected from the group consisting of moieties having the formula $-(CH_2)_nX$, where n is an integer from 0 to 10 and X is selected from the group consisting of $-N_3$, $-H$, and $-ONO_2$;

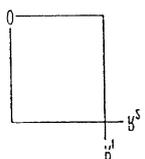
obtaining a co-catalytically effective quantity of a triethoxonium salt which is capable of acting as a co-catalyst of a polymerization reaction of said cyclic ether monomer;

obtaining a co-catalytically effective quantity of an alcohol which is capable of acting as a co-catalyst of a polymerization reaction of said cyclic ether monomer;

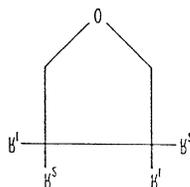
combining said salt and said alcohol to form a polymerization catalyst mixture;

adding said cyclic ether to the mixture of said salt and said alcohol in a non-polar solvent and allowing polymerization of said cyclic ether to occur and allowing said salt to scavenge trace water contained within said mixture such that a polymer of controlled functionality is produced rapidly.

The examiner
 references in rejecting



or



relies on the following
 the appealed claims:

Wardle et al. (Wardle)
 Farooq

4,988,797
 5,124,417

Jan. 29, 1991
 Jun. 23, 1992
 (filed Feb. 12, 1990)

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ISSUES

Claims 6-11 and 13-19 stand rejected under 35 U.S.C. § 103 as being unpatentable over Wardle in view of Farooq. We affirm-in-part.

In reaching our decision in this appeal, we have given careful consideration to the appellants' specification and claims, to the applied prior art references and to the respective positions articulated by the appellants and the examiner. We make reference to the examiner's

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answer (Paper No. 21, mailed May 30, 1995) for the examiner's reasoning in support of the rejection, and to the appellants' brief (Paper No. 20, filed March 9, 1995) for the appellants' arguments thereagainst.²

THE INVENTION

Appellants' invention is directed to (a) methods for polymerizing cyclic ether monomers having 4 or 5 member rings, i.e., substituted or unsubstituted oxetanes or tetrahydrofurans, wherein the polymerization is catalyzed by an alkylating salt together with a co-catalyst alcohol which forms an initiating species together with the salt and (b) polymers formed thereby which have controlled functionality and high molecular weights (specification, page 24).

OPINION

Wardle discloses cationic polymerization of 4 and 5 member cyclic ether monomers, e.g., oxetanes and tetrahydrofurans, using an acid catalyst together with an alcohol which complexes with the acid to form an "initiator adduct," wherein the acid is used at a molar ratio relative to the hydroxyl groups of the alcohol at between about 0.05:1 to about 0.5:1. The adduct complexes with a cyclic ether monomer to form an activated cyclic ether. Uncomplexed alcohol reacts with the activated cyclic ether monomer to open the ring and provide terminal hydroxyl groups on the exposed ends of the ether

²Appellants' reply brief (Paper No. 22, filed June 26, 1995) was denied entry by the examiner in the communication mailed October 17, 1995 (Paper No. 23). Appellants have not filed a petition under 37 C.F.R. § 1.181 seeking review of the examiner's decision to deny entry of the reply brief. Therefore, the reply brief has not been considered in reaching our decision in this appeal.

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residues. The hydroxyl groups at the end of the polymer chain attack other activated cyclic ether monomers, opening the rings and again leaving terminal hydroxyl groups. Polymerization proceeds until the cyclic ether monomers are substantially exhausted or the reaction is terminated by other means. The acid catalyst may be a Lewis acid and the alcohol may be mono- or difunctional. (Col. 2, line 27- col. 4, line 37). Described advantages include controlled polymer functionality and molecular weight, as well as lower polydispersity and increased percent incorporation of polyhydric alcohol molecules (col. 4, lines 33-37; col. 7, lines 26-29; col. 8, lines 32-37). Production of energetic oxetane polymers is also disclosed (col. 8, lines 38-40).

The examiner relies on the background discussion in Farooq for disclosing that it was well known in the art to use oxonium salts having nucleophilic counterions to initiate cationic polymerization of various monomers and obtain high molecular weight polymers (col. 1, lines 17-30) and that triethyloxonium tetrafluoroborate is a known stable complex example thereof (col. 1, lines 40-44); and, on the disclosure of Farooq for disclosing that such monomers include cyclic ethers, e.g., oxetanes and tetrahydrofurans (col. 7, lines 37-45) as described in Wardle.

According to the examiner, it would have been *prima facie* obvious to combine two known initiators of cyclic ethers, i.e., the catalyst of Farooq with the alcohol catalyst of Wardle, for their recognized purpose of initiating polymerization of identical monomers because the catalysts are the same type of chemical ingredients (answer, pages 5-10). According to the examiner, the artisan of ordinary skill “would have a reasonable expectation of success that the

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[combined] process would succeed because the catalysts are not newly invented, rather they are both known to initiate polymerization of the identically disclosed and presently claimed monomers” (answer, page 11, last para.).

As a preliminary matter, we note that appellants have argued claims 6-11 and 13-19 as a single group (brief, page 5). Insofar as the method claims and the product claims present separate issues of patentability and in accordance with 37 C.F.R. § 1.192(c)(5)(1993), we select claims 6 and 17 as representative of the method and product claims, respectively, and decide the appeal on the basis of claims 6 and 17 alone.

As to method claim 6, Wardle discloses that an alcohol in combination with a Lewis acid forms an “initiator adduct” which is capable of initiating polymerization of cyclic ether monomers, *not* that alcohol independently initiates polymerization. Since Wardle does not disclose that the alcohol *per se* is a catalyst, the examiner’s analysis is factually incorrect. Secondly, the examiner has not provided reasons why one of ordinary skill in the art would have selected the particular triethyloxonium tetrafluoroborate catalyst of Farooq’s background discussion (as opposed to Farooq’s inventive catalyst, e.g., a triethoxonium salt having an at least partially fluorinated hydrocarbylsulfonato metallate counterion) from the cited prior art references for combination in the manner claimed. Third, as pointed out by appellants, the catalytic reactions of Wardle and Farooq proceed by distinctly different reaction mechanisms (brief, page 8). Although the examiner opines that “[t]he prior art recognizes that catalysts can be combined” (answer, page 10), the examiner has not pointed out and we do not find where the

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prior art of record teaches that multiple catalytic systems can be combined in the same environment at the same time with a reasonable expectation of success, e.g., that the conditions of each reaction would be mutually compatible, that the components of one system would not adversely interact/impact the components of another system, etc. The reasonable expectation of success must be found in the prior art and not based on applicant's disclosure. Therefore, we conclude that the examiner has not established a *prima facie* case of obviousness for the subject matter of claim 6. Having concluded that the examiner has not established a *prima facie* case of obviousness as to method claim 6, we do not reach appellants' discussion of unexpected results on pages 14-20 of the brief as it relates to the method claims. Since claims 7-11 and 13-16 depend on claim 6, our conclusion equally applies to these claims.

We treat product-by-process claim 17 separately. According to the examiner, the process of Wardle produces energetic polymers of controlled functionality and molecular weight from the claimed cyclic ether monomers (answer, para. bridging pages 12-13). Appellants argue (a) that the claimed polymers have "precise hydroxyl functionality and molecular weight" (brief, page 12; para. bridging pages 16-17) and (b) unexpected results, i.e., (i) that the data in appellants' specification shows polymers of greater molecular weight than shown in Wardle's patent (brief, page 18), and (ii) that the comparative data in the Wardle Declaration filed April 26, 1994 (Paper No. 13, the "Wardle Declaration") shows polymers which are nearer a target molecular weight and have functionalities of 1.0 as opposed to Wardle's polymer having a functionality of 1.2 and 1.4 (brief, pages 19-20).

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The patentability of a product-by-process claim is based on the product itself. Where, as here, a product-by-process claim is rejected over a prior art product that appears to be the same or similar to the claimed product, although produced by a different process, the burden is on applicants to produce evidence establishing an unobvious difference between the claimed product and the prior art product. *In re Thorpe*, 777 F.2d 695, 697, 227 USPQ 964, 966 (Fed. Cir. 1985); *In re Marosi*, 710 F.2d 799, 803, 218 USPQ 289, 292-93 (Fed. Cir. 1983). We also note that claims in a patent application are given the broadest reasonable interpretation in light of the specification and limitations in the specification are not read into claims without a proper claim basis therefore. *In re Zletz*, 893 F.2d 319, 321, 13 USPQ2d 1320, 1322 (Fed. Cir. 1989); *In re Prater*, 415 F.2d 1393, 1404, 162 USPQ 541, 550 (CCPA 1969).

Here, claim 17 requires a polymer of “controlled functionality.” The specification does not define “controlled functionality” as any particular (range of) functionality, e.g., a functionality of 1.0, and claim 17 does not recite any particular functionality, e.g., a functionality of 1.0. Further, claim 17 is not limited to any particular molecular weight polymer. As to molecular weight, the specification states that “higher molecular weights in range from approximately 1,000 to approximately 50,000 are more readily obtainable” (page 9, lines 12-14). Therefore, since Wardle has provided specific direction to enable both polymer functionality and molecular weight to be controlled (see e.g., cols. 7-8), has provided energetic polymers of controlled polymer properties, including functionality and molecular weights within the range of higher molecular weights recited in the specification, we find that the examiner has

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established a *prima facie* case of obviousness sufficient to shift the burden to appellants to produce evidence establishing an unobvious difference between the claimed product and the prior art product.

The “objective evidence of nonobviousness must be commensurate in scope with the claims which the evidence is offered to support.” *In re Grasselli*, 713 F.2d 731, 739-40, 218 USPQ 769, 777 (Fed. Cir. 1983). Arguments of counsel cannot take the place of evidence. *In re De Blauwe*, 736 F.2d 669, 705, 222 USPQ 191, 196 (Fed. Cir. 1984); *In re Payne*, 606 F.2d 303, 315, 203 USPQ 245, 256 (CCPA 1979).

Here, a comparison of the data in appellants’ specification to the data disclosed in Wardle carries little, if any, probative weight since the polymers were obtained under different experimental conditions, e.g., with different temperatures and alcohols, and appellants have not discussed what effect these differences and other result effective variables, e.g., the relative concentration of alcohol, catalyst and monomer, may have had on the results. As to the comparative data presented in the Wardle Declaration, we agree with the examiner that the showing is not commensurate in scope with the claimed invention (answer, page 14). The showing is limited to one specific monomer, i.e., a substituted oxetane called BAMO, whereas the claim encompasses not only (un)substituted oxetanes but also (un)substituted tetrahydrofurans. The data is also based on variable molar ratios of catalyst/alcohol, different amounts of monomer and different temperatures. Appellants have not

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explained the effect of such a multiplicity of variables upon the resulting data.³ Moreover, obtaining polymers of increased molecular weight when the reaction system is refluxed, i.e., heated, may not be an unexpected result in view of Farooq's disclosure that using heat can induce initiation of polymerization or increase its rate, depending upon the type of cationic initiator used (col. 8, lines 5-8).⁴ Appellants have the burden of explaining their data.

For the above reasons, we determine that appellants have not met their burden of showing unexpected results. Reevaluating the patentability based on the total record, we determine that the preponderance of the evidence weighs in favor of obviousness within the meaning of § 103, giving due consideration to appellants' arguments and evidence. *In re Oetiker*, 977 F.2d 1443, 1445, 24 USPQ2d 1443, 1444 (Fed. Cir. 1992). Accordingly, the rejection of claims 17-19 under 35 U.S.C. § 103 as being unpatentable over Wardle in view of Farooq is sustained.

³According to appellants' specification, "[t]he resulting polymer is of a predictable molecular weight based upon the relative amounts of alkylating salt, alcohol, and monomer" (page 6, lines 24-26). Thus, these relative amounts appear to be result-effective variables.

⁴The examiner has not rejected the claimed product over the product polymers of Farooq. However, in the event of further prosecution, the examiner and appellants should review the complete disclosure in Farooq, including its disclosure of a cationic polymerization initiator comprising an oxonium salt, e.g., triethoxyxonium, and a non-nucleophilic counterion which is an at least partially fluorinated hydrocarbylsulfonato metallate, the use of heat to induce or accelerate the polymerization reaction, and obtention of high molecular weight polymers, e.g., with M_w of 6.85×10^5 (col. 2, lines 5-56; col. 14, line 60 - col. 15, line 33) in view of the above discussion on the patentability of a product-by-process and take appropriate action.

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CONCLUSION

To summarize, the decision of the examiner to reject claims 6-11 and 13-16 under 35 U.S.C. § 103 as unpatentable over Wardle in view of Farooq is **reversed**, but the decision of the examiner to reject claims 17-19 under 35 U.S.C. § 103 as unpatentable over Wardle in view of Farooq is **affirmed**.

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

AFFIRMED-IN-PART

CHARLES F. WARREN)	
Administrative Patent Judge)	
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)	BOARD OF PATENT
THOMAS A. WALTZ)	APPEALS
Administrative Patent Judge)	AND
)	INTERFERENCES
)	
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CAROL A. SPIEGEL)	
Administrative Patent Judge)	

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