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Paper 95
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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

CORNING INCORPORATED
Petitioner

v.

DSM IP ASSETS B.V.
Patent Owner

Case IPR2013-00043 (Patent 7,171,103 B2)
Case IPR2013-00044 (Patent 6,961,508 B2)

Before FRED E. McKELVEY, GRACE KARAFFA OBERMANN, JENNIFER S. BISK, SCOTT E. KAMHOLZ, and ZHENYU YANG, *Administrative Patent Judges*.

McKELVEY, *Administrative Patent Judge*.

FINAL WRITTEN DECISION
35 U.S.C. § 318(a) and 37 C.F.R. § 42.73(b)

I. INTRODUCTION

A. Background

Petitioner, Corning Incorporated ("Corning") filed ten petitions in November of 2012, challenging patents owned by DSM Assets B.V. ("DSM").

All ten petitions were at least partially granted, and therefore, progressed into the trial phase of an *inter partes* review.

This is the final written decision for IPR2013-00043 and IPR2013-00044, both of which raise common issues.

1. IPR2013-00043

The petition in IPR2013-00043 (Paper 3) challenges claims 1-18 (all of the claims) of U.S. Patent No. 7,171,103 B2 (Ex. 1001 ("the '103 patent")).

Patent Owner, DSM, filed a preliminary response on February 21, 2013. Paper 13 ("Prelim. Resp. 43").

On May 13, 2013, the Board granted the petition as to all of the proposed grounds. Paper 14.

The Board found that there was a reasonable likelihood that Corning would prevail with respect to the claims challenged in the petition on the following grounds:

Claims Challenged	Basis	Reference(s)[1]
1-15	§ 102	Szum ’157
1-15	§ 103	Szum ’157 and Szum ’041
16 and 17	§ 103	Szum ’157 and Yamazaki
16 and 17	§ 103	Szum ’157, Szum ’041, and Yamazaki
18	§ 103	Szum ’157, Yamazaki, and Winningham
18	§ 103	Szum ’157, Szum ’041, Yamazaki, and Winningham

After institution of trial, DSM filed a patent owner response (Paper 43 (“PO Resp. 43”)) and a supplemental response (Paper 75).

DSM also filed a motion to amend claims submitting proposed new claim 19 for claim 12. Paper 45.

Corning filed (1) a reply to the patent owner response (Paper 64), (2) a supplemental reply (Paper 76), and (3) an opposition to DSM’s motion to amend (Paper 63).

DSM then filed a reply in support of its motion to amend. Paper 77.

2. IPR2013-00044

The petition in IPR2013-00044 (Paper 2) challenges claims 1-22 (all of the claims) of U.S. Patent No. 6,961,508 B2 (Ex. 1001 (“the ’508 patent”)).

DSM filed a preliminary response on February 21, 2013. Paper 11.

On May 13, 2013, the Board granted the petition as to all of the proposed grounds. Paper 12.

[1] The references are: (1) WO 98/21157 (Ex. 1002) (“Szum ’157” also referred to in the record as “Szum ’21157”); (2) U.S. Patent No. 5,664,041 (Ex. 1003) (“Szum ’041”); (3) EP 0 874 012 A1 (Ex. 1004) (“Yamazaki”); and (4) WO 01/49625 A1 (Ex. 1005) (“Winningham”).

The Board found that there was a reasonable likelihood that Corning would prevail with respect to the claims challenged in the petition on the following grounds:

Claims Challenged	Basis	Reference(s)[2]
1-8, 10-13, and 15-22	§ 103	Szum '157 and Szum '041
9 and 14	§ 103	Szum '157, Szum '041, and Edwards

After institution of trial, DSM filed (1) a patent owner response (Paper 42), and (2) a supplemental response (Paper 71).

DSM also filed a motion to amend claims by submitting proposed new claim 19 for claim 12. Paper 44.

Corning filed (1) a reply to the patent owner response (Paper 60), (2) a supplemental reply (Paper 72), and (3) an opposition to DSM's motion to amend (Paper 59).

DSM then filed a reply in support of its motion to amend. Paper 73.

3. Summary

Oral argument for both cases took place on February 11, 2014. *See* IPR2013-00043, Paper 94; IPR2013-00044, Paper 91 (Transcripts of Oral Argument).

The Board has jurisdiction under 35 U.S.C. § 6(c).

This final written decision is issued pursuant to 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73.

[2] The references are: (1) WO 98/21157 (Ex. 1002) ("Szum '157" also referred to in the record as "Szum '21157"); (2) U.S. Patent No. 5,664,041 (Ex. 1003) ("Szum '041"); and (3) U.S. Patent No. 5,416,880 (Ex. 1004) ("Edwards").

Corning has failed to show by a preponderance of evidence that any of challenged claims 1-18 of the ’103 patent and challenged claims 1-22 of the ’508 patent are unpatentable.

Because we do not find any of the challenged claims unpatentable, we need not consider DSM’s motions to amend claims, and therefore, the motions to amend claims in both IPR2013-00043 and IPR2013-00044 are *dismissed* as moot.

B. Related Proceedings

Corning and DSM are simultaneously involved in eight other *inter partes* reviews based on patents claiming similar subject matter:
(1) IPR2013-00045; (2) IPR2013-00046; (3) IPR2013-00047;
(4) IPR2013-00048; (5) IPR2013-00049; (6) IPR2013-00050;
(7) IPR2013-00052; and (8) IPR2013-00053.

C. The ’103 Patent

The ’103 patent is titled “Coated Optical Fibers” and relates to coated optical fibers having primary and secondary coatings and to radiation-curable primary coating compositions. Ex. 1001, 1:14-16.

The patent explains that the “soft ‘cushioning’” primary coating is usually in contact with the fiber, while the “relatively hard” secondary coating surrounds the primary coating. *Id.* at 1:23-26.

The coatings confer “microbending” resistance on the optical fiber, thereby helping to reduce attenuation of optical power along the fiber. *Id.* at 1:27-29.

The patent is directed, in particular, to coated optical fibers in which the primary coating provides “good microbending resistance,” and simultaneously, has a "high cure speed" that will not unduly limit production rates. *Id.* at 1:34-37.

Claims 1 and 16, reproduced below, illustrate the claimed subject matter (dispositive limitation in italics):

> 1. An inner primary coating composition having:
> (a) an in-situ modulus (after cure) of less than 0.6 MPa;
> *(b) a cure dose to attain 95% of the maximum attainable modulus of less than 0.65 J/cm^2*; and
> (c) a modulus retention ratio (after cure) of at least 0.6 after hydrolytic aging; wherein said composition comprises:
> (i) 20–98 wt. % relative to the total weight of the composition of a radiation curable urethane (meth) acrylate oligomer having polyether polyol backbone;
> (ii) 0–80% wt. % relative to the total weight of the composition of one or more reactive diluents;
> (iii) 0.1–20 wt. % relative to the total weight of the composition of one or more photoinitiators; and
> (iv) 0–5 wt. % relative to the total weight of the composition of additives.
>
> 16. A coated optical fiber comprising:
> (a) an optical fiber;
> (b) a primary coating obtained by curing the coating composition according to claim 1;
> (c) a secondary coating, wherein said secondary coating has:
> (i) a Tg of about 60° C. or higher;
> (ii) an elongation at break of at least 20%; and
> (iii) a tensile modulus of at least 500 MPa.

D. The '508 Patent

The '508 patent is titled "Coated Optical Fibers" and relates to coated optical fibers having primary and secondary coatings and to radiation-curable, primary coating compositions. 44 Ex. 1001, 1:12-16.

The patent explains that the "soft 'cushioning'" primary coating is usually in contact with the fiber, while the "relatively hard" secondary coating surrounds the primary coating. *Id.* at 1:19-26.

The coatings confer "microbending" resistance on the optical fiber, thereby helping to reduce attenuation of optical power along the fiber. *Id.* at 1:23-26.

The patent is directed, in particular, to coated optical fibers in which the primary coating provides "good microbending resistance" and simultaneously has a "high cure speed" that will not unduly limit production rates. *Id.* at 1:30-34.

Claims 1 and 20, reproduced below, illustrate the claimed subject matter (dispositive limitations in italics):

> 1. A coated optical fiber comprising:
> (i) an optical fiber;
> (ii) a primary coating; and
> (iii) a secondary coating;
> wherein
> (a) said coated optical fiber has an attenuation increase of less than 0.650 dB/km at 1550 nm;
> (b) said primary coating has a modulus retention ratio after hydrolytic aging of at least 0.5 and/or a glass transition temperature (Tg) below –35° C.; and
> *(c) said primary coating is obtained by curing a primary coating composition having a cure dose to attain 95% of the maximum attainable modulus of less than 0.65 J/cm^2.*
>
> 20. An inner primary coating composition having:
> (a) an in-situ modulus (after cure) of less than 0.6 MPa;
> *(b) a cure dose to attain 95% of the maximum attainable modulus of less than 0.65 J/cm^2*; and
> (c) a modulus retention ratio (after cure) of at least 0.6 after hydrolytic aging.

II. ANALYSIS

A. Claim Construction

As a step in our analysis for determining whether the challenged claims are unpatentable, we determine the meaning of the claims.

The Board interprets claims of an unexpired patent using the broadest reasonable construction in light of the specification of the patent. *See* 37 CFR § 42.100(b); Office Patent Trial Practice Guide, 77 Fed. Reg. 48,756, 48,766 (Aug. 14, 2012).

The dispositive claim limitation in the ’103 patent is limitation (b) of claim 1: “a cure dose to attain 95% of the maximum attainable modulus of less than 0.65 J/cm^2.”

The dispositive claim limitation in the ’508 patent is limitation (c) of claim 1: “said primary coating is obtained by curing a primary coating composition having a cure dose to attain 95% of the maximum attainable modulus of less than 0.65 J/cm^2.”

Corning has failed to prove that prior art compositions inherently attain 95% of the maximum attainable modulus at a cure dose of less than 0.65 J/cm^2.

DSM has failed to prove that the prior art compositions do not attain 95% of the maximum attainable modulus at a cure dose of less than 0.65 J/cm^2.

Accordingly, there is no occasion to construe further the language of limitation (b) of claim 1 of the ’103 patent or limitation (c) of the ’508 patent, hereinafter the “95% limitations.”

B. Testimony and documentary evidence

The testimony and documentary evidence relevant to the “95% limitations” in both IPRs are essentially the same.

We discuss the testimony and evidence, citing to the evidence of record in IPR2013-00043.

Nevertheless, Table 1, reproduced below, correlates chronologically by exhibit number the common testimony and documentary evidence submitted, and upon which we have relied in deciding both IPR2013-00043 and IPR2013-00044.

Table 1

Description of testimony or document	Ex. number in IPR2013-00043	Ex. number in IPR2013-00044
U.S. Patent 5,416,880 “Edwards”	None	1004
’508 Patent	None	1001
’103 Patent	1001	None
WO 98/21157 “Szum ’157”	1002	1003
U.S. Patent 5,664,041 “Szum ’041”	1003	1002
Winningham declaration	1006	1005
Kouzmina declaration	1007	1006
Reichmanis declaration	1028	1026
Bowman cross-examination	1033	1031
Anderson	1038	1036
Schmid	1047	1045
Chawla	1050	1048
Kouzmina cross-examination	2022	2021
Kouzmina cross-examination	2024	2022
Winningham cross-examination	2028	2027
Bowman declaration	2030	2029
Dose-segment modulus data	2049	2048
Dose-segment modulus data	2050	2049
Dose-segment modulus data	2051	2050
Dose-segment modulus data	2052	2051
Curve fit and statistical analysis	2053	2052
Proc. of the Int’l Soc. for Optical Eng’g	2058	2057

In support of its petitions, Corning offered the testimony of Ms. Inna I. Kouzmina (Ex. 1007).

According to Kouzmina, compositions were made in accordance with Example 10-1 and Example 10-2 as described by Szum '157 (Szum '157, 118:10-21; Table 15).

Kouzmina also testified (Ex. 1007 ¶ 29) concerning "[t]ests . . . conducted on primary coatings as described in Example 10-1 and Example 10-2 of Szum ['157], to measure the cure dose to attain 95% of the maximum attainable modulus of the cured coatings in accordance with procedures set forth in the '103 patent at 9:21-43."

Kouzmina explains (Ex. 1007 ¶ 30):

> Specifically, cure dose was determined by Dose vs. Modulus curve analysis. Six radiation-cured sample films of each composition were prepared, with each sample film being obtained by applying and curing, at room temperature under a nitrogen atmosphere, a composition having a thickness of approximately 75 microns on a glass plate. Each composition was cured with a different dose: 0.2, 0.3, 0.5, 0.75, 1.0, and 2.0 J/cm^2 respectively. Six specimens were cut from the center portion of each prepared sample film. MTS Tensile Tester of MTS Systems Corporation was used to measure the 2.5% secant modulus of each specimen. The dose-modulus curve was then created by plotting the modulus values vs. the dose and by fitting a curve through the data points. The "cure dose" of the coating composition was determined to be the dose at which 95% of the ultimate secant modulus was attained.

The experimental cure dose to attain 95% of the maximum attainable modulus is described in Kouzmina Table B (Ex. 1007 ¶ 31):

Table B. Cure Dose to Attain 95% of the Maximum Attainable Modulus

Sample	Results
Szum '21157 Example 10-1	0.37 J/cm^2
Szum '21157 Example 10-2	0.22 J/cm^2

In a light most favorable to Corning, we will assume the "modulus" mentioned in paragraph 31 and Table B is a secant modulus.

In support of its petitions, Corning also offered the testimony of Dr. Michael Winningham (Ex. 1006).

According to Winningham (*id.* ¶ 92):

> Element (b) of ['103 patent] claim 1 requires the primary coating composition to have "a cure dose to attain 95% of the maximum attainable modulus of less than 0.65 J/cm^2." The primary coating composition[s] of Examples 10-1 and 10-2 of Szum ['157] have a cure dose of 0.37 J/cm^2 and 0.22 J/cm^2, respectively, to attain 95% of the maximum attainable modulus. Kouzmina Decl. [Ex. 1007] ¶ 31. Thus, the limitation of element (b) of claim 1 is met by the disclosure of Szum ['157].

Kouzmina's cross-examination reveals that she oversaw, but did not personally conduct, the experimental work reported in her direct testimony.

Kouzmina testified that (1) she instructed two Corning scientists to make oligomers per information described in the prior art (presumably including Szum '157), and (2) asked them to make compositions described in the prior art and report back to her when their experimental work was done. Ex. 2022, 433:17–435:2.

In due course, the two scientists "generated results and reported back . . . those results [to Kouzmina]." *Id.* at 484:21-23.

When asked how she knew the two Corning scientists accurately made the oligomers, Kouzmina testified that "I had their notes and they reported to me for this project, so I have their information." *Id.* at 436:20-22.

What Kouzmina means by "notes" is not clear; we will assume that the "notes" are laboratory-like notebooks and related documents.

When asked "[w]hat level of scrutiny did you give the oligomer synthesis," Kouzmina responded "I . . . instructed the [Corning scientists] making oligomers to follow the . . . prior art as closely as possible. And I trusted their judgment on executing this." Ex. 2024, 866:25–867:8.

Winningham testified that he did not "review any lab notebooks" and "I don't recall seeing any other data." Ex. 2028, 690:18-19.

Data and other documents related to Corning's tests did not accompany the Petition.

As a result of "additional discovery" (37 C.F.R. § 41.150(c)), DSM obtained some laboratory notebooks and other documents. PO Resp. 43, 9.

After analysis of all the evidence available to it, DSM challenges the accuracy of the "Results" set out in Table B. *Id.* at 20-21.[3]

In support of its response, DSM submitted the direct declaration testimony of Dr. Christopher N. Bowman. *Id.* at 21.

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[3] On page 20, footnote 2, of the patent owner's response (PO Resp. 43), DSM attempts to incorporate by reference arguments made in its preliminary response (Prelim. Resp. 13). We decline to consider arguments incorporated by reference. Incorporation by reference is an unacceptable means of permitting a party to exceed page limits set out in the rules. 37 C.F.R. § 42.24; *see also DeSilva v. DiLeonardi*, 181 F.3d 865, 866-67 (7th Cir. 1999) ("[A]doption by reference amounts to a self-help increase in the length of the appellate brief." "[I]ncorporation [by reference] is a pointless imposition on the court's time. A brief must make all arguments accessible to the judges, rather than ask them to play archaeologist with the record.").

DSM's challenge is based on two rationales: (1) its own counter-testing (*id.* at 21-25); and (2) Corning's cure dose analysis, which is said to be statistically invalid (*id.* at 26-28).

Bowman testified that he understood that DSM prepared compositions described in Examples 10-1 and 10-2 of Szum '157. Ex. 2030 ¶ 71.

Bowman further testified that DSM determined cure doses to attain 95% maximum attainable modulus of the compositions described in Examples 10-1 and 10-2 of Szum '157. *Id.* ¶¶ 113-14.

According to Bowman (Ex. 2030 ¶ 114):

> Six sample films of each of Szum '157 Examples 10-1 and 10-2 were prepared on a plate and exposed to a dose of 0.2 J/cm^2, 0.3 J/cm^2, 0.5 J/cm^2, 0.75 J/ cm^2, 1.0 J/ cm^2, and 2.0 J/cm^2, respectively, from a 600 W "D"-lamp under a blanket of nitrogen to ensure maximum cure at each dose. Prior to exposure of the samples, the dose was measured three times using a calibrated ILT490 broadband UVA/UVB radiometer from International Light Technologies, which is calibrated at least once every six months, to confirm proper dosage. After each sample was exposed to the relevant dose, it was conditioned at about 23±1ºC and at a relative humidity of about 50% for sixteen to twenty-four hours. The center of each sample was then cut into specimens having a width of 12.7 mm. The thickness of each specimen was measured at five different locations to confirm that each specimen exhibited uniform thickness. This data, as well as the average thickness of each specimen, is summarized in Exhibits 2049-2052.

Exhibits 2049-52 describe DSM "mean" thickness data as follows:

Exhibit	Mean thickness	Segment or Secant Modulus
2049	0.086	Segment
2050	0.090	Secant
2051	0.095	Segment
2052	0.099	Secant

DSM's average segment and secant moduli of reproduced Examples 10-1 and 10-2 as a function of cure dose (J/cm^2) are reported in Table 3 of Bowman's declaration (Ex. 2030 ¶ 115).

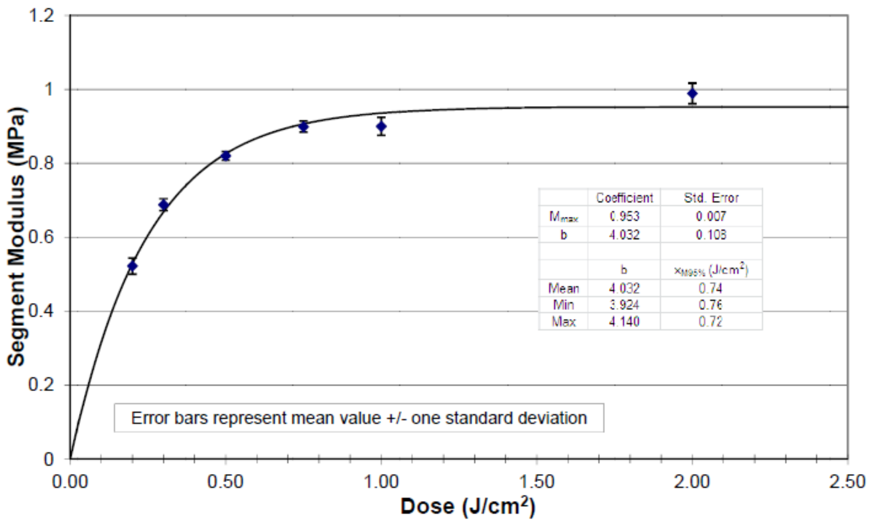
Table 3

Szum '157 Coating Composition	Cure Dose (J/cm^2)	Segment Modulus (MPa)	Secant Modulus (MPa)
Example 10-1	0.2	0.52±0.02	0.53±0.03
	0.3	0.69±0.02	0.69±0.02
	0.5	0.82±0.01	0.82±0.01
	0.75	0.90±0.01	0.90±0.01
	1.0	0.90±0.02	0.90±0.02
	2.0	0.99±0.03	0.99±0.03
Example 10-2	0.2	0.29±0.02	0.31±0.02
	0.3	0.40±0.02	0.41±0.02
	0.5	0.49±0.01	0.50±0.01
	0.75	0.53±0.02	0.54±0.01
	1.0	0.55±0.01	0.55±0.01
	2.0	0.62±0.01	0.62±0.01

Error in Table 3 is reported as one standard deviation.

Data described in Table 3 and Exhibits 2049-52 was used to plot segment and secant modulus (MPa) as a function of dose (J/cm^2) curves.

An example of a DSM curve of segment modulus as a function of dose for Szum '157 Example 10-1 is set out below (Ex. 2030).



Depicted is a graph of segment modulus v. dose
for Szum '157 Example 10-1

According to Bowman (*id.* ¶ 117):

> After curve-fitting, the cure dose to attain 95% of the maximum attainable segment modulus was determined to be 0.74 J/cm^2 with a 95% confidence interval ranging from 0.72 J/cm^2 to 0.76 J/cm^2. R^2 for the fit was 0.9786 based on the average segment modulus at each dose and 0.9640 based on all data points at each dose. (See Ex. 2053[, 2 of 11 and 11 of 11]).

Bowman explains the significance of "R^2" as follows (Ex. 2030 ¶ 122):

> In statistics, R^2 is known as the coefficient of determination. In a curve fitting analysis, R^2 is a measure of the correlation between the fitted curve and the observed data. R^2 generally falls within a range of 0 to 1. An R^2 value close to 1 indicates a strong correlation between the fitted curve and the observed data, which means that the fitted curve accurately reflects the behavior of the observed data. When R^2 is closer to 1, the fitted curve can be used to accurately predict the behavior of a system. In contrast, an R^2 value close to 0 indicates very little correlation between the fitted curve and the observed data, which means that the fitted curve does not accurately reflect the behavior of the observed data. When R^2 is closer to 0, the fitted

curve cannot be used to accurately predict the behavior of a system.

A summary of DSM cure dose data for segment and secant moduli for Szum ’157 appears in Table 4 of Bowman’s declaration testimony (*id.* ¶ 117).

Table 4

Measured modulus at 2.5% Strain	Szum ’157 Example	Cure dose to attain 95% maximum attainable modulus (J/cm^2)	Meets the “less than 0.65 J/cm^2” cure dose claim limitation?
Segment	10-1	0.74	No
Secant	10-1	0.73	No
Segment	10-2	0.83	No
Secant	10-2	0.81	No

According to the data in Table 4, DSM did not obtain 95% of the maximum attainable modulus with a dose of less than 0.65 J/cm^2 in reproducing Szum ’157 Examples 10-1 and 10-2. Ex. 2030 ¶ 118.

Bowman therefore found that Examples 10-1 and 10-2 cannot inherently describe subject matter within the scope of claim 1 of the ’103 patent. *Id.* ¶ 119.

Bowman also addressed the statistical validity of Corning’s experimental results. *Id.* ¶ 120.

Unlike DSM, Corning did not provide underlying data with its petition to support cure doses reported by Kouzmina and Winningham.

Bowman Table 5, reproduced below, compares cure dose measured by Corning and DSM for secant modulus. *Id.*

Table 5

Szum '157 Coating Composition	$M_{95\%}$ Cure Dose as measured by Corning (J/cm^2)	$M_{95\%}$ Cure Dose as measured by DSM (J/cm^2)	Difference (J/cm^2)
Example 10-1	0.37	0.73	0.36
Example 10-2	0.22	0.81	0.59

While Corning believes its cure dose falls within the scope of claim 1 of both the '103 patent and the '508 patent, the DSM cure dose does not.

Through additional discovery, DSM was able to obtain the underlying data said to support Corning's cure dose "results."

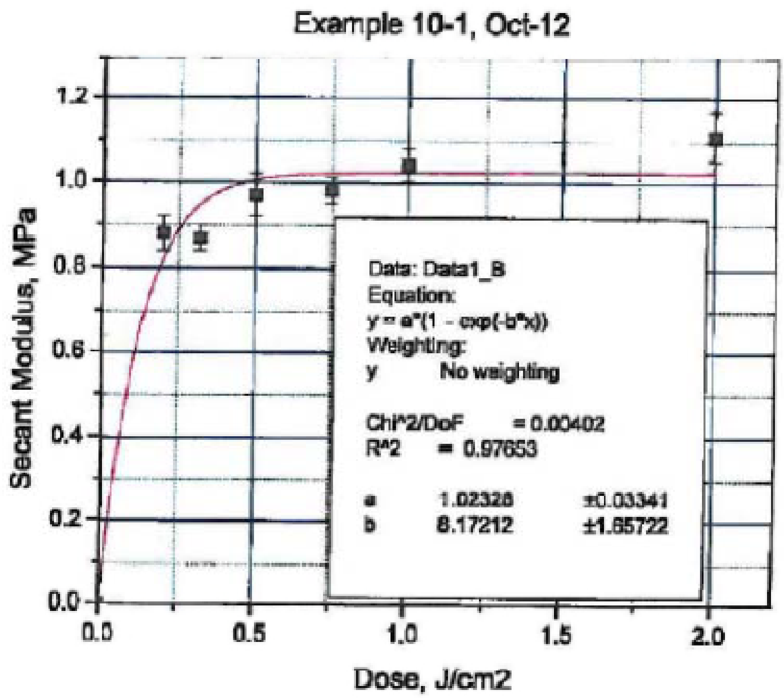
According to Bowman, the underlying data "does not support the conclusion that Examples 10-1 or 10-2 exhibit a cure dose that necessarily falls within the scope of the claims of the '103 patent." Ex. 2030 ¶ 120.

Bowman Table 6, reproduced below, summarizes Corning's underlying data produced to support its cure dose values. *Id.* ¶ 121.

Bowman Table 6

Dose (J/cm^2)	Example 10-2 Secant Modulus (MPa)	Example 10-1 Secant Modulus (MPa)
0.2	0.61±0.05	0.88±0.04
0.3	0.63±0.04	0.87±0.03
0.5	0.66±0.08	0.97±0.05
0.75	0.62±0.06	0.98±0.03
1.0	0.67±0.06	1.04±0.04
2.0	0.65±0.06	1.11±0.06

Bowman Figure 5, reproduced below, represents a curve fit for secant modulus (MPa) versus dose (J/cm^2) for Example 10-1 of Szum '157. *Id.* Fig. 5.



Bowman Fig. 5 depicts a plot of secant modulus v. dose
for Szum '157 Example 10-1

The R^2 fitting reported by Corning is said to be 0.9765. Ex. 2030, 57.

Bowman testified that upon review of the Corning R^2 values, "I was immediately suspicious . . ." (*id.* ¶ 122), apparently because the "dose data . . . looks relatively constant" (*id.* ¶ 123).

Bowman asked DSM to independently analyze Corning's data using essentially the same approach used by DSM to analyze cure dose data of its experiments. *Id.* ¶ 124.

Bowman Table 7, reproduced below, compares Corning's R^2 values vis-à-vis DSM's R^2 values.

Bowman Table 7

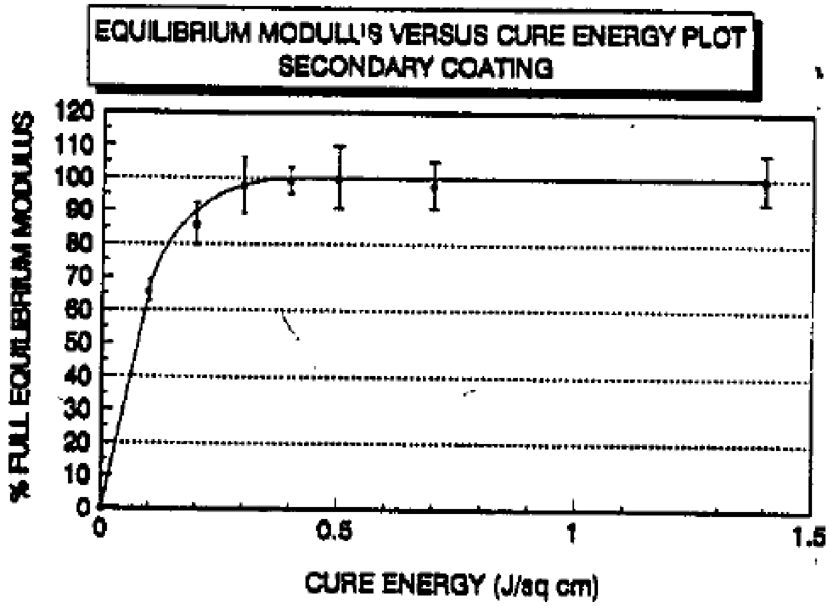
Statistical Method	Example 10-1		Example 10-2	
	Corning R^2	DSM's Re-evaluation of Corning's R^2	Corning R^2	DSM's Re-evaluation of Corning's R^2
Curve-fitting average values of modulus at each dose	0.9765	0.5728	0.8958	0.4656

Statistical Method	Example 10-1		Example 10-2	
	Corning R^2	DSM's Re-evaluation of Corning's R^2	Corning R^2	DSM's Re-evaluation of Corning's R^2
Curve-fitting all values of modulus at each dose	-	0.4805	-	0.0542

As a result of Corning's relatively lower R^2 values, which Bowman characterizes as "significantly low R^2 values," Bowman opines (Ex. 2030 ¶ 126 (footnote omitted)):

> Upon seeing such low R^2 values, a person of ordinary skill in the art would have immediately recognized that . . . Corning's data was subject to some type of systematic or experimental error (e.g., the use of a malfunctioning or uncalibrated radiometer) . . . . Accordingly, Corning's data set cannot eliminate systematic and experimental errors as an explanation as to why its data does not conform to the modulus-dose behavior predicted by Equation 1 [(*see* Ex. 2030 ¶ 116)] and as typically observed. (Ex. 2058).

Figure 1 of Exhibit 2058, reproduced below, shows equilibrium moduli ranging from about 65 to about 100% as a function of cure dose.



Depicted is a curve of modulus as a function of cure energy.

Corning's modulus curves show moduli ranging from (1) about 0.85 to about 1.2 MPa as a function of cure dose (Ex. 2030 Fig. 5), and (2) about 0.60 to about 0.65 MPa as a function of cure dose (*Id.* Fig. 6) for the compositions of Examples 10-1 and 10-2 of Szum '157, respectively.

According to Bowman, "[a]s indicated by Figure 1 in Exhibit 2058, as early as 1993, data for modulus as a function of dose was readily obtained[,] and data over a broad range of modulus values are indicated." *Id.* ¶ 131.

Corning has not pointed to any evidence that Winningham conducted any independent analysis of Corning's curve fitting. *Cf.* Ex. 2028, 761:19 – 762:9 (discussing, on cross-examination, an "Exhibit 130" and "Exhibit 131"—exhibits we have not found in the record and, in any event, would not be properly numbered exhibits).

In reply to Bowman's curve-fitting analysis, Corning submitted testimony of Dr. Elsa Reichmanis. Ex. 1028.

Corning relies on Reichmanis to make two points: (1) Corning's curve-fitting is based on a proper analysis, while DSM's curve-fitting is not; and (2) the difference in cure dose may be a result of the thickness of the films tested on behalf of Corning vis-à-vis those tested on behalf of DSM.

A first observation by Reichmanis is that Corning's modulus versus dose curves generally have the same overall appearance as typical modulus versus dose curves—steep initial rise then a generally leveling off. *See, e.g.*, *id.* ¶ 74 (referring to Ex. 1047 Fig. 4.13), ¶ 79 (referring to Ex. 1050 Fig. 6).

Reichmanis therefore "find[s] nothing peculiar or suspicious about Corning's modulus versus dose curves for Examples 10-1 and 10-2." Ex. 1028 ¶ 80.

A second observation is that Bowman, in determining R^2 values, excluded the origin (data point 0,0) from the calculation. *Id.* ¶ 83.

Reichmanis testified that "I have reviewed Corning's recalculation of its own R^2 values by excluding the origin (data point 0,0) from the calculation and I observed that they obtained R^2 values similar to what DSM obtained." *Id.*

According to Reichmanis, "it makes [no] statistical sense to exclude the origin (data point 0,0) from the data." *Id.* ¶ 84.

Reichmanis points to no credible underlying data to support her testimony.

Reichmanis notes that (*id.* ¶ 85):

> Regardless, the issues raised by DSM and Dr. Bowman regarding Corning's R^2 values are not dispositive, because what

> matters is what dose is required to attain 95% of the maximum attainable modulus and not how well the curve fits to the data. For example, if one digitizes the above modulus vs. dose curve from . . . Ex. 1050 [(presumably referring to Figure 6)] . . . and calculates the R^2 with the origin (0,0), the adjusted R^2 is approximately 0.994, and without the point of origin (0,0), the adjusted R^2 is approximately 0.163. What I view in terms of Corning's data and their modulus vs. dose curves are entirely consistent with what I would expect for coatings that have a cure dose to attain 95% of the maximum attainable modulus of 0.37 J/cm^2 and 0.22 J/cm^2, respectively.

Reichmanis does not explain what recalculation of R^2 (presumably Figure 6 of Exhibit 1050) has to do with R^2 values associated with curve-fitting of Corning's and DMS's reproductions of Szum '157 Examples 10-1 and 10-2.

Moreover, unlike Bowman, who called attention to DSM calculations (*see, e.g.*, Ex. 2053), Reichmanis does not call our attention to documentation underlying her calculation of adjusted R^2.

C. Discussion

1. Arguments considered

In resolving this case on the merits, we consider only the arguments made in the Petition, the Response, and the Reply.

We find that:

(1) Corning has *not* established by a preponderance of the evidence that Examples 10-1 and 10-2 inherently describe an inner primary coating meeting the "95% limitation" required by paragraph (b) of claim 1 of the '103 patent or paragraph (c) of claim 1 of the '508 patent, and

(2) DSM has *not* established by a preponderance of the evidence that Examples 10-1 and 10-2 do *not* meet the required "95% limitation".

Accordingly, we do not find it necessary to consider DSM's Supplemental Response (Paper 75) or Petitioner's Reply thereto (Paper 76).

In reaching our decision that Corning has failed to establish inherency as to the "95% limitation," we have assumed that both Corning and DSM accurately reproduced the coatings of Szum '157. In light of our findings, it is not necessary to determine whether the coatings were accurately reproduced.

2. Corning's proofs

On the factual issue of whether Corning has established that Szum '157 inherently describes a coating having the required cure dose, there is conflicting testimony of Bowman and Reichmanis.

Both witnesses appear to be qualified scientists.

We have no reason to question the good faith of either witness and we believe they have testified faithfully to their respective opinions.

Nevertheless, to the extent that there is a conflict between the two witnesses with respect to Corning's *cure dose proofs*, we credit Bowman over Reichmanis.

The Bowman testimony is detailed and supported by underlying data, while the Reichmanis testimony is general and is not credibly supported by underlying data. 37 C.F.R. § 42.65(a), (b)(5).

Corning argues that Bowman ignored the origin (0,0 data point).

At a dose of zero (0) J/cm^2, Bowman tells us that the modulus would be "close to zero." Ex. 1034, 1097:25.

Reichmanis believes the origin should be included in any R^2 determination and maintains that the only thing that counts is the cure dose (not the R^2 value). Ex. 1028 ¶¶ 84-85.

Fitting data points to a curve is important.

The data points, when properly fitted to a curve, permit one skilled in the art to determine whether 95% of the maximum attainable modulus is attainable at the relevant cure dose for a given composition.

According to the ’103 patent, cure doses of 0.2, 0.3, 0.5, 0.75, 1.0, and 2.0 J/cm^2 are to be employed. ’103 patent 9:58-60; *see also* ’508 patent 7:58-59.

A “dose-modulus curve was then created by plotting the modulus values vs. the dose and by fitting a curve through the data points.” ’103 patent 9:39-41.

The ’103 patent and the ’508 patent do not indicate that the data points are to include the origin (0,0 data point).

Reichmanis provides no credible explanation as to why the origin should be included in the face of the explicit disclosure of the ’103 patent and the ’508 patent.

Once the data points are curve-fitted, the “maximum” modulus surfaces at the point where the curve flattens out. *See, e.g.*, Ex. 2030, Fig. 1 (essentially between a dose of 1.00 and 2.00 J/cm^2).

At a dose of 0.2, the modulus is essentially 0.5.

Once one skilled in the art has a properly fitted curve, determination of 95% of the maximum modulus is possible.

As seen visually in Figure 1, the maximum appears to be at a modulus of about 0.95 MPa.

As shown in Figure 1, the cure dose required to obtain 95% of the maximum attainable modulus was determined to be from 0.72 to 0.76 J/cm^2—a value outside the limits of claim 1 of the ’103 patent and claim 1 of the ’508 patent.

Corning has failed to establish that the properties of the compositions of Examples 10-1 and 10-2 of Szum ’157 fall within the scope of the claims of either patent.

3. DSM’s counter-tests

DSM is under no burden to establish that Examples 10-1 and 10-2 *do not* inherently describe coatings meeting the 95% limitation.

We address the DSM’s counter-proofs to complete our analysis because those proofs have been addressed by DSM and Corning.

On the factual issue of whether DSM has established that Szum ’157 *does not* inherently describe a coating having the required 95% cure dose, there is conflicting testimony of Bowman and Reichmanis.

The ’103 patent indicates that cure dose tests should be performed on a sample having a thickness of “approximately 75 microns.” ’103 patent 9:28-29; ’508 patent 7:53-57.

As noted earlier, both witnesses appear to be qualified scientists.

Again, we have no reason to question the good faith of either witness, and we believe they have testified faithfully to their respective opinions.

Nevertheless, to the extent that there is a conflict between the two witnesses with respect to DSM’s *cure dose proofs*, on this factual issue, we credit Reichmanis over Bowman.

Reichmanis testified that the cure dose may be a function of sample thickness. *See* Ex. 1028 ¶ 56 (“[A]s the thickness of the coatings increases, the dose required to cure the coatings to a given degree also increases." (citing Ex. 1038, 516 ("[L]ogic would predict that thicker films would be cured to a lesser extent, at a given dose, than thinner films.")).

Reichmanis graphically illustrates the point, explaining (Ex. 1028 ¶¶ 57, 58; Fig. 2):

> Less light (*i.e.*, fewer photons) in the deeper portions of the thicker film means that fewer photoinitiators are being activated by light to release free-radicals, resulting in fewer free-radical induced polymerization reactions. Consequently, thicker films will be cured to a lesser extent at a given dose than thinner films.

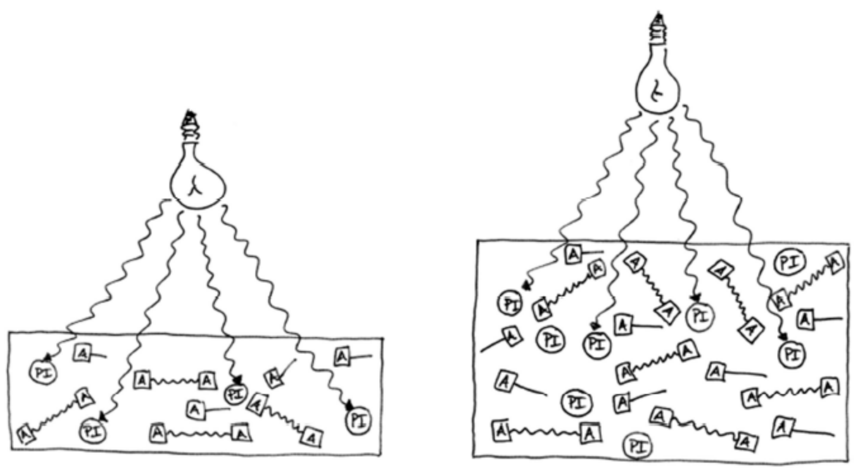


FIGURE 2

Depicted are thin and thick films showing free-radical polymerizations in both

As is apparent in the thinner film (left side), a cure dose may react with a larger percentage of monomers than in the thicker film (right side).

Bowman acknowledged that DSM did not use a coating having a thickness of 75 microns: "I noticed it was 100 microns. I didn't correlate the 100 microns [used by DSM] to the 75 microns [described by the '508 patent] and notice the difference." Ex. 1033, 866:2-4.

Reichmanis makes out a plausible factual basis for finding that cure dose may be a function of thickness, and Bowman has not provided a credible, scientifically based rationale to overcome Reichmanis' plausible basis.

DSM has failed to establish that Examples 10-1 and 10-2 do *not* inherently describe the 95% limitation in claim 1 of the patents.

4. Decision on the 95% limitations

Corning has the burden of proof, and has failed to sustain its burden of establishing by a preponderance of evidence that the prior art inherently describes the 95% limitation.

While DSM does not have any burden to disprove inherency, it failed to establish that the relevant limitation is not inherent..

A preponderance of evidence has not emerged on the factual question of whether Szum '157 Examples 10-1 and 10-2 inherently describe a composition within the scope of the claims of the '103 and '508 patents.

Hence, the party with the burden of proof necessarily loses. *Yamaha Int'l Corp. v. Hoshino Gakki Co.*, 840 F.2d 1572, 1580 n.11 (Fed. Cir. 1988).

5. Decisions on other issues

Corning's obviousness challenges fall with its failure to establish that the prior art inherently describes the 95% limitation—a limitation of all the claims of both patents.

III. MOTIONS TO AMEND

In IPR2013-00043, DSM has filed a Motion to Amend (Paper 45) contingent on claim 12 of the '103 patent being held unpatentable.

In IPR2013-00044, DSM has filed a Motion to Amend (Paper 44) contingent on claim 17 of the ’508 patent being held unpatentable.

Since claim 12 of the ’103 patent and claim 17 of the ’508 patent have not been held unpatentable, there is no occasion to reach or decide the motions to amend.

IV. JUDGMENT

Accordingly, it is

ORDERED that Corning’s request in IPR2013-00043 for cancellation of claims 1-18 of the ’103 patent is *denied*;

FURTHER ORDERED that Corning’s request in IPR2013-00044 for cancellation of claims 1-22 of the ’508 patent is *denied*;

FURTHER ORDERED that the Motion to Amend in IPR2013-00043 is *dismissed* as moot;

FURTHER ORDERED that the Motion to Amend in IPR2013-00044 is *dismissed* as moot; and

FURTHER ORDERED that because this is a final written decision, parties to the proceeding seeking judicial review of the decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

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