

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

LG Energy Solution, Ltd.,
Petitioner,

v.

Molecular Rebar Design, LLC,
Patent Owner.

IPR2024-01012
Patent 10,608,282 B2

**PATENT OWNER'S PRELIMINARY RESPONSE
TO PETITION FOR *INTER PARTES* REVIEW OF
U.S. PATENT NO. 10,608,282**

TABLE OF CONTENTS

I.	INTRODUCTION.....	1
II.	THE COMBINATION OF THE CITED REFERENCES IN BOTH GROUNDS FAILS TO RENDER THE ONLY INDEPENDENT CLAIM OBVIOUS	1
A.	Claim Construction.....	1
B.	Person Of Ordinary Skill In The Art	2
C.	Priority Date	2
D.	The '282 Patent.....	3
E.	The Cited References Fail to Establish Obviousness Of Independent Claim 1 In Both Ground 1 And Ground 2.....	4
1.	The Primary Reference of Bosnyak-392 (LGES-1005) in Ground 1A is directed to a single distribution of long carbon nanotubes and leads away from having a low aspect ratio distribution with short nanotubes as claimed	5
2.	Based on Son's teachings, a POSITA would not combine Son with Bosnyak-392 as suggested in Ground 1A.....	9
3.	Petitioner misquotes Bosnyak-392 in trying to justify its combination with Son	11
4.	Petitioner's lone alleged reason to combine Bosnyak-392 with Son is illusory	15
5.	The Son reference does not teach the claimed aspect ratios of Independent Claim 1	16
6.	The primary reference of Bosnyak-129 (LGES-1006) in Ground IIA is directed to long nanotubes and leads away from having a low aspect ratio distribution with short nanotubes as claimed	19
7.	The Bosnyak-129 and Albuerne (LGES-1009) combination would not be made, nor would the proposed combination yield Independent Claim 1's bimodal aspect ratio or discrete requirements	22
F.	Petitioner Has Failed To Present A <i>Prima Facie</i> Case Of Obviousness ..	27
III.	THE <i>FINTIV</i> FACTORS FAVOR DENIAL OF INSTITUTION UNDER § 314(a).....	29
A.	Factor 1: A Stay Is Unlikely In the Parallel Proceeding	29

B. Factor 2: The Median Time To Trial Is Before The Deadline For A Final Written Decision.....	30
C. Factor 3: The Parties Have Invested Significant Time And Money In The Parallel Proceeding.....	30
D. Factor 4: All Issues In The Petition Overlap With The Parallel Proceeding And The Parallel Proceeding.....	31
E. Factor 5: The Parties In Both Proceedings Are The Same.....	33
F. Factor 6: Petitioner’s Arguments Do Not Plainly Lead To A Conclusion Of Unpatentability	33
IV. CONCLUSION	34

TABLE OF AUTHORITIES**Page(s)****Cases**

<i>Apple Inc. v. Fintiv, Inc.</i> , IPR2020-00019, Paper 15 (PTAB May 13, 2020)	1, 29, 30, 33
<i>Commscope Technologies LLC v. Dali Wireless, Inc.</i> , IPR2022-01242, Paper 23 (PTAB Feb. 27, 2023)	33
<i>Ericsson Inc. v. Koninklijke KPN N.V.</i> , IPR2022-00069	31
<i>Fintiv</i> , IPR2020-00019, Paper 11	31
<i>Graham v. John Deere Co.</i> , 383 U.S. 1 (1966)	27
<i>In re Kahn</i> , 441 F.3d 977 (Fed. Cir. 2006)	28
<i>KSR Int’l Co. v. Teleflex Inc.</i> , 550 U.S. 398 (2007)	27, 28
<i>In re Magnum Oil Tools Int’l, Ltd.</i> , 829 F.3d 1364 (Fed. Cir. 2016)	27
<i>Mintz v. Dietz & Watson, Inc.</i> , 679 F.3d 1372 (Fed. Cir. 2012)	18
<i>Molecular Rebar Design, LLC et al v. LG Energy Solution, Ltd.</i> , 2-24-cv-00107, ECF No. 60 (E.D. Tex. July 19, 2024)	29
<i>SK Innovation Co., LTD v. LG Chem, LTD</i> , IPR2020-01239, Paper 14 (PTAB Jan. 12, 2021)	33
<i>Vector Flow, Inc. v. HID Glob. Corp.</i> , IPR2023-00353, Paper 8 (PTAB July 17, 2023)	33, 34

Statutes

35 U.S.C. § 103	27
35 U.S.C. §315(e)(2)	31

Other Authorities

37 C.F.R. § 42.6(e)(4)	36
37 C.F.R. § 42.24(b)(1)	35
37 C.F.R. § 42.24(d)	35
Katherine K. Vidal, <i>Interim Procedure for Discretionary Denials in AIA Post-Grant Proceedings with Parallel District Court Litigation</i> (June 21, 2022)	32, 33

EXHIBIT LIST

Exhibit No.	Description
MRD-2001	Denial of Motion to Stay in parallel civil suit in EDTX
MRD-2002	Docket Control Order in parallel civil suit in EDTX
MRD-2003	Excerpts from Defendants' P.R. 3-3 Invalidity Contentions in parallel civil suit in EDTX

I. INTRODUCTION

Patent Owner Molecular Rebar Design, LLC (“MRD”) submits this Preliminary Response to the Petition by LG Energy Solution, Ltd. (“LGES” or “Petitioner”) seeking *inter partes* review of claims of U.S. Patent No. 10,608,282 (the “’282 Patent”). The Board should deny the Petition for multiple independent reasons, none of which can be cured by LGES.

First, the presented Invalidity Grounds fail to render the challenged claims obvious. That is, the prior art relied upon, alone and in combination, fails to teach or suggest each and every claim element. The prior art combinations presented in Grounds 1 and 2 suffer from numerous deficiencies. And, even if the prior art did not have these deficiencies, Petitioner’s rationale for the combinations is lacking. Accordingly, Petitioner has failed to present a *prima facie* case of obviousness.

Second, the Board should deny institution based on the *Fintiv* factors.

II. THE COMBINATION OF THE CITED REFERENCES IN BOTH GROUNDS FAILS TO RENDER THE ONLY INDEPENDENT CLAIM OBVIOUS

As discussed below, the combinations presented in Grounds 1 and 2 fail to render obvious the only independent claim (claim 1) of the ’282 Patent. Therefore, the Board should deny institution.

A. Claim Construction

For purposes of this Preliminary Response only, MRD interprets all claim terms in accordance with their ordinary and customary meaning. MRD reserves the

right to propose constructions and other arguments in this IPR, the parallel litigations, or other proceedings involving the '282 Patent to the extent necessary to respond to constructions proposed by Petitioner or as required to respond to the facts or circumstances.

Additionally, outside of the claim construction section of the Petition on page 7, Petitioner asserts on page 63 n.9 that “Petitioner interprets “average aspect ratio” to mean “aspect ratio,” which is consistent with how this term was interpreted during prosecution of the '282 Patent.” (Petition, p.63 n.9). For purposes of this Preliminary Response only, MRD takes no position on this assertion since the Petition’s deficiencies outlined below are unrelated to the construction of this claim term.

B. Person Of Ordinary Skill In The Art

For purposes of this Preliminary Response only, MRD does not dispute the Petition’s definition of level of ordinary skill in the art. (Petition, p.7).

C. Priority Date

Petitioner argues that the claims do not enjoy the benefit of priority to either the June 21, 2012 provisional application or the June 22, 2012 provisional application. Petitioner then argues that, therefore, the claims only enjoy the priority of the application’s filing date of June 21, 2013. (See Petition, pp. 2-4). For purposes

of this Preliminary Response only, MRD takes no position regarding the priority date.

D. The '282 Patent

The '282 Patent pertains to nanotube compositions for binders, electrolytes, and separator films for energy storage and collection devices such as batteries and has one independent claim, i.e., claim 1. (LGES-1001, abstract). The single independent claim pertains to a composition that employs “a plurality of discrete carbon nanotube fibers, said fibers having an aspect ratio of from about 10 to about 500, and wherein at least a portion of the discrete carbon nanotube fibers are open ended.” (LGES-1001, independent claim 1).

The independent claim also requires:

- (1) “40% to 90% by number of the discrete carbon nanotubes have an aspect ratio of 30-70”; and
- (2) “1% to 30% by number of the discrete carbon nanotubes have an average aspect ratio of 80-140” (LGES-1001, claim 1).

Thus, the claimed composition of independent claim 1 has two different sizes of discrete carbon nanotubes according to its aspect ratio. As a person of ordinary skill in the art understands (and as Petitioner adopts), an aspect ratio is the length of

a nanotube divided by the nanotube's diameter.¹ Thus, in the claimed composition a large portion (40% to 90% of the total discrete nanotubes by number) are short nanotubes with an aspect ratio (length / diameter) of 30-70. A smaller portion (1% to 30% of the total nanotubes by number) are much longer and have an aspect ratio of 80-140.

E. The Cited References Fail to Establish Obviousness Of Independent Claim 1 In Both Ground 1 And Ground 2

The Petition alleges two main invalidity grounds (Grounds 1 and 2), that comprise five individual grounds, covering claims 1-16. *Ground 1A* is based on the alleged obviousness of claims 1-16 over Bosnyak-392 and Son; *Ground 1B* is based on the alleged obviousness of claim 4 over Bosnyak-392, Son, and So; *Ground 1C* is based on the alleged obviousness of claim 11 over Bosnyak-392, Son, and Gu; *Ground 2A* is based on the alleged obviousness of claims 1, 5-9, and 12-16 over Bosnyak-129 and Albuerne; and *Ground 2B* is based on the alleged obviousness of claims 2-4 and 10-11 over Bosnyak-129, Albuerne, and Gu.

¹ See, e.g., Petitioner stating, “[g]iven Bosnyak-129’s teaching that the aspect ratio is ‘the ratio of length of the nanotube to the diameter of the nanotube,’ LGES-1006, [0007] . . . ” (Petition, p.61; see also LGES 1005, para. [0042], stating, “the carbon nanotubes have a length to diameter ratio (aspect ratio)....”).

As noted above, claim 1 is the only independent claim at issue and this response will focus on the grounds involving claim 1, i.e., Grounds 1A and 2A, and the deficiencies thereof. Because Grounds 1A and 2A fail to show why independent claim 1 is obvious, Grounds 1B, 1C, and 2B similarly fail to show the obviousness of claims 2-16 depending therefrom.

1. The Primary Reference of Bosnyak-392 (LGES-1005) in Ground 1A is directed to a single distribution of long carbon nanotubes and leads away from having a low aspect ratio distribution with short nanotubes as claimed

Bosnyak-392 focuses on exfoliating bundles of carbon nanotubes to produce individualized carbon nanotubes while maintaining the carbon nanotubes length as long as possible, i.e., a high aspect ratio, so that shorter nanotubes with a lower aspect ratio are avoided. In that vein, Bosnyak-392 states:

Current technologies cannot fully exfoliate bundles of carbon nanotubes to produce individualized carbon nanotubes in the solid state without significant chemical and physical property modifications taking place to the carbon nanotubes.

...

As noted above, current methods for producing exfoliated carbon nanotubes usually results in shortening or functionalization of the nanotubes. Such **shortening or functionalization also generally**

results in reduced conductivity, which is also disadvantageous for

applications where high electrical conductivity is beneficial.

(LGES-1005, paras. [0003], [0006]) (emphasis added). Bosnyak-392 further explains its embodiments use full-length carbon nanotubes:

In some embodiments, the carbon nanotubes are full-length carbon nanotubes. That is, in embodiments having full-length carbon nanotubes, the exfoliated carbon nanotubes are about the same length as the as-grown carbon nanotubes from which they are produced, and the carbon nanotube ends are generally closed in certain various embodiments.

...

That is, in some embodiments, the **carbon nanotubes are full length carbon nanotubes that are not shortened during exfoliation.**

(LGES-1005, paras. [0038], [0041]) (emphasis added). Bosnyak-392 continues and explains the advantages of its long exfoliated nanotubes and the deficiencies of shorter nanotubes:

The **exfoliated carbon nanotubes prepared by the techniques described hereinabove are typically longer** than are carbon nanotubes exfoliated using existing technology. For instance, as described previously, other separation techniques often result in carbon

nanotube damage and shortened carbon nanotube lengths. In certain applications, particularly those involving electrical conduction or mechanical reinforcement, **shorter carbon nanotubes may not provide adequate electrical conductivity or structural integrity. . .** Furthermore, **longer carbon nanotube lengths may increase the toughness** of the polymer composites over those made with shorter carbon nanotubes.

(LGES-1005, para. [0073]) (emphasis added).

Finally, Bosnyak-392 provides an example where the multi-walled carbon nanotubes were not shortened by the acid treatment:

Example 5 touts that “**multi-wall carbon nanotubes were not substantially shortened by the acid treatment.**”

(LGES-1005, para. [0097]) (emphasis added).

In addition to not shortening nanotubes to a small aspect ratio as the '282 Patent requires, Bosnyak-392 desires to have a single, narrow distribution of large carbon nanotube lengths and therefore employs a special precipitation technique to achieve that and separate the longer nanotubes that it touts as more advantageous. Specifically, Bosnyak-392 states:

In some embodiments, **the exfoliated carbon nanotubes are selectively precipitated by length.** The carbon nanotube length varies

between about 500 nm and about 10 mm in some embodiments, between about 500 nm and 1 mm in some embodiments, between about 500 nm and 500 μ m in some embodiments, between about 500 nm and 1 μ m in some embodiments and various subranges thereof. In some embodiments, the exfoliated carbon nanotubes have an average length that is not substantially different than that of the bundled carbon nanotubes from which they are produced. That is, in some embodiments, the carbon nanotubes are full length carbon nanotubes that are not shortened during exfoliation. In some embodiments, the exfoliated carbon nanotubes are prepared from bundled carbon nanotubes, and **the exfoliated carbon nanotubes have a narrower distribution of lengths than do the bundled carbon nanotubes. That is, a subrange of exfoliated carbon nanotube lengths may be obtained** from a population of bundled carbon nanotubes having a distribution of lengths.

(LGES-1005, para. [0041]) (emphasis added).

Based on the teachings of Bosnyak-392 as described above, to obtain individualized carbon nanotubes while maintaining the carbon nanotubes length as long as possible and to employ precipitation to obtain a narrow distribution of long nanotubes, a POSITA would not deviate from the Bosnyak-392 teachings and

employ a large portion of short nanotubes as Petitioner suggests in its Ground 1A combination with Son. That is, reading Bosnyak-392 and its desire for long nanotubes for better electrical conductivity, there would be no reason that a POSITA would somehow employ a large amount (40%-90%) of short nanotubes with 30-70 aspect ratio and a lesser amount of longer nanotubes (1%-30%) with 80-140 average aspect ratio. Petitioner does not explain why any or all of the Bosnyak-392 passages teaching against short nanotubes would be ignored by a POSITA to make the Petitioner's suggested combination. This is a first independent reason that Ground 1A fails.

Furthermore, as explained below, the teachings of Son would lead away from a Bosnyak-392 combination. This is a second independent reason why Petitioner's Ground 1A fails.

2. Based on Son's teachings, a POSITA would not combine Son with Bosnyak-392 as suggested in Ground 1A

Both the Bosnyak-392 and Son reference counsel a POSITA against making the Petitioner's suggested combination with Bosnyak-392.

As shown above in Section II.E.1, there are at least five paragraphs in Bosnyak-392 explaining why one should maintain the carbon nanotubes length as long as possible, i.e., a high aspect ratio, and that shorter nanotubes with a lower aspect ratio are to be avoided. (*See, e.g.*, LGES-1005, paras. [0006], [0028], [0041], [0073], [0097]).

Among the reasons to employ longer carbon nanotubes and avoid shorter nanotubes, Bosnyak-392 states “[s]uch shortening or functionalization also generally results in reduced conductivity, which is also disadvantageous for applications where high electrical conductivity is beneficial” (LGES-1005, para. [0006]); “shorter carbon nanotubes may not provide adequate electrical conductivity or structural integrity” (LGES-1005, para. [0073]); “longer carbon nanotube lengths may increase the toughness of the polymer composites over those made with shorter carbon nanotubes” (*Id.*); and “the carbon nanotubes are full length carbon nanotubes that are not shortened during exfoliation.” (LGES-1005, para. [0041]).

Based on the Bosnyak-392 passages above, it cannot be fairly disputed that a stated objective of Bosnyak-392 is to maintain longer nanotubes and avoid changing the length and shortening the nanotubes. As Petitioner concedes, Son teaches the fundamental opposite of Bosnyak-392:

Dr. Guido further explains that a POSITA would have recognized that Son contemplates changing the aspect ratios of its nanotubes by changing their lengths while keeping their diameters constant.

(Petition, p.22). Petitioner cannot and does not even attempt to reconcile this fundamental difference in the teachings of Bosnyak-392 and Son. Accordingly, this is a second independent reason that Petitioner’s Ground 1A fails.

3. Petitioner misquotes Bosnyak-392 in trying to justify its combination with Son

There are a number of misstatements about Bosnyak-392 in the Petition. These statements are addressed below.

(1) Petitioner statement: Citing to para. [0073] of Bosnyak-392 Petitioner states at page 17:

Bosnyak-392 similarly and expressly recognizes the desire to use a bimodal aspect ratio distribution in its composition, disclosing that “[i]n certain applications, particularly those involving electrical conduction or mechanical reinforcement,” both shorter and longer carbon nanotubes can be used together.

(Petition, p.17).

However, para. [0073] says nothing about any “bimodal aspect ratio distribution” or that “both shorter and longer carbon nanotubes can be used together” as Petitioner claims. In fact, Bosnyak-392 para. [0073] leads one away from using shorter carbon nanotubes at all by stating:

The exfoliated carbon nanotubes prepared by the techniques described hereinabove are typically longer than are carbon nanotubes exfoliated using existing technology. For instance, as described previously, other separation techniques often result in carbon nanotube damage and shortened carbon nanotube lengths. In certain applications, particularly

those involving electrical conduction or mechanical reinforcement, **shorter carbon nanotubes may not provide adequate electrical conductivity or structural integrity.** For example, by having at least a portion of longer carbon nanotubes present with electrical devices such as energy storage device, a higher degree of electrical connectivity at a fixed carbon nanotube volume fraction can be achieved. **Furthermore, longer carbon nanotube lengths may increase the toughness of the polymer composites over those made with shorter carbon nanotubes.**

(LGES-1005, para. [0073]) (emphasis added).

(2) Petitioner statement: Citing to the same para. [0073] of Bosnyak-392. Petitioner states at page 9:

Bosnyak-392 further recognizes that concurrently using both short and long carbon nanotubes (and by extension having different aspect ratios) can result in a composite with improved “electrical conduction or mechanical reinforcement” properties.

(Petition, p. 9).

However, as stated above for the first Petitioner statement, para. [0073] of Bosnyak-392 says nothing about “concurrently using both short and long carbon

nanotubes (and by extension having different aspect ratios)” and, in fact, the cited paragraph states the following regarding shorter carbon nanotubes:

The exfoliated carbon nanotubes prepared by the techniques described hereinabove are typically longer than are carbon nanotubes exfoliated using existing technology. For instance, as described previously, other separation techniques often result in carbon nanotube damage and shortened carbon nanotube lengths. In certain applications, particularly those involving electrical conduction or mechanical reinforcement, **shorter carbon nanotubes may not provide adequate electrical conductivity or structural integrity.** For example, by having at least a portion of longer carbon nanotubes present with electrical devices such as energy storage device, a higher degree of electrical connectivity at a fixed carbon nanotube volume fraction can be achieved. **Furthermore, longer carbon nanotube lengths may increase the toughness of the polymer composites over those made with shorter carbon nanotubes.**

(LGES-1005, para. [0073]) (emphasis added).

(3) Petitioner statement: Citing to the Abstract and paras. [0037] and [0073] of Bosnyak-392, Petitioner states at page 11:

Bosnyak-392 disclose [sic] making “energy storage devices and polymer composites” using “exfoliated carbon nanotubes” and further that concurrently using carbon nanotubes having two different aspect ratios can help create composite materials with improved mechanical and electrical properties.

(Petition, p.11).

But as noted above, para. [0073] of Bosnyak-392 does not support the use of shorter carbon nanotubes (a fact that was already described immediately above in response to Petitioner’s statements (1) and (2)). And once again neither the Abstract nor the other cited paragraph [0037] say anything about “concurrently using carbon nanotubes having two different aspect ratios” as Petitioner alleges.

What’s more, the Petitioner’s statement that a POSITA would somehow use “two different aspect ratios” based on Bosnyak-392 are contradicted by Petitioner itself. Specifically, when attempting to rationalize the combination of Bosnyak-392 and Son, Petitioner states “a POSTA would have known to use nanotubes that are not vastly different from one another in terms of size/mass.” (Petition, p.21). Of course, this is directly contrary to Petitioner’s disproven allegation, also discussed above, regarding Bosnyak “concurrently using carbon nanotubes having two different aspect ratios.” (Petition, p.11).

The Petition's premise based on misstatements that Bosnyak-392 teaches a "bimodal aspect ratio distribution," using "both shorter and longer carbon nanotubes," and "concurrently using carbon nanotubes having two different aspect ratios" is not supported and is a third independent reason to deny institution.

4. Petitioner's lone alleged reason to combine Bosnyak-392 with Son is illusory

Despite Petitioner's misleading, strained, and/or debunked statements above about Bosnyak-392 and the combination with Son, Petitioner must concede, and thus does concede, that Bosnyak-392 does not "disclose the specific nanotube aspect ratios to use . . ." (Petition, p.11). Therefore, in order to justify combining Bosnyak-392 with Son, Petitioner then relies on the catch-all justification of applying known techniques to a known structure to yield predictable results. (Petition, pp.11-12).

However, Petitioner's conclusory reasoning fundamentally relies upon the false premise that Bosnyak-392 teaches "using carbon nanotubes having two different aspect ratios can help create composite materials with improved mechanical and electrical properties." (Petition, p. 11). As described in Sections II.E.1-3 above, Bosnyak-392 does not teach using two different aspect ratios but consistently teaches away from using short nanotubes as fully described in Section II.E.1. Therefore, Petitioner's "logic" to combine is fatally flawed as to Ground 1A and the combination fails for at least the three above-described independent reasons.

5. The Son reference does not teach the claimed aspect ratios of Independent Claim 1

Even though Petitioner chose Son to combine with Bosnyak-392 in an attempt to cure its admitted deficiency of failing to disclose the claimed aspect ratios of claim 1 (i.e., “wherein 40% to 90% by number of the discrete carbon nanotubes have an aspect ratio of 30-70 and wherein from 1% to 30% by number of discrete carbon nanotubes have an average aspect ratio 80-140”), Son fails to disclose the claimed aspect ratios. Son’s first deficiency is that its aspect ratios are based on weight percentage, while the aspect ratios of claim 1 are based on the number of discrete carbon nanotubes. Petitioner is forced to resort to allegations that these claimed aspect ratios are some “design choice” since Son clearly lacks explicit disclosure of the claimed aspect ratio. Additionally, Petitioner alleges that Son somehow discloses the aspect ratios by “express teachings.” (Petition, p.12). Yet as described below, this is an inaccurate statement.

Petitioner focuses on “Son’s bimodal aspect ratio distribution of its two nanotube groups” based on weight that are represented in Son’s Figure 6.² (Petition, pp.18-19; LGES-1003, ¶49, Fig. 6). Yet Petitioner understands that Son lacks any

² Petitioner notes another Son aspect ratio (see Petition, p.21) but the focus of its analysis is trying to convert Son’s aspect ratio based on weight to one based on number, as is claimed.

express disclosure of the claimed aspect ratios which are based on nanotube number and not nanotube weight. In an attempt to cure this deficiency, Petitioner relies upon its expert who it claims provides three different approaches to try and change Son's aspect ratios based on weight to meet the claimed aspect ratio based on carbon nanotube number. (Petition, p.20). As a threshold issue, this appears to be a classic case of hindsight since Petitioner's expert starts with what he is trying to achieve and then makes numerous assumptions in working backward to achieve his stated goal of meeting the claimed ranges. The Federal Circuit has stated the hindsight problem as:

This statement of the problem represents a form of prohibited reliance on hindsight. The district court has used the invention to define the problem that the invention solves. Often the inventive contribution lies in defining the problem in a new revelatory way. In other words, when someone is presented with the identical problem and told to make the patented invention, it often becomes virtually certain that the artisan will succeed in making the invention. Instead, PCM must prove by clear and convincing evidence that a person of ordinary skill in the meat encasement arts at the time of the invention would have recognized the adherence problem recognized by the inventors and found it obvious to

produce the meat encasement structure disclosed in the '148 patent to solve that problem.

Mintz v. Dietz & Watson, Inc., 679 F.3d 1372, 1377-78 (Fed. Cir. 2012). Here, Petitioner has engaged in hindsight and has failed to meet its burden. Stated differently, Petitioner's expert started with the claimed aspect ratios and then tried to arrive at them using the combination of Bosnyak-392 and Son.

The expert's assumptions and models were designed specifically to arrive at the claimed aspect ratios. Indeed, without the claimed aspect ratios as a starting point, the expert would have no reason to perform any calculations or combine the references in the manner alleged. For example, as the expert states he is trying to "go from Son's weight distribution domain to the number distribution domain of the '282 Patent." (LGES-1003, para.58). This statement represents a form of prohibited reliance on hindsight as it shows that the approach is trying to map from one domain to another, yet fails to explain why this mapping from a weight distribution domain to a number distribution domain would be performed by one of ordinary skill in the art independent of the elements of claim 1.

What's more, the expert does not cite any peer reviewed studies or articles, or other evidentiary support, for his methodology that purports to correlate an aspect ratio of an unknown number of nanotubes based on weight to an aspect ratio of nanotubes based on a number of nanotubes of an unknown weight. As a rough

analogy, Petitioner's expert appears to be opining that he developed a method wherein by knowing the total weight of all the bowling balls in a bowling alley, the number of bowling balls in the bowling alley can be determined, even though bowling balls may vary in weight, say, from 6-16 pounds.

The use of improper hindsight and an after-the-fact, non-peer reviewed methodology should be rejected.

6. The primary reference of Bosnyak-129 (LGES-1006) in Ground IIA is directed to long nanotubes and leads away from having a low aspect ratio distribution with short nanotubes as claimed

The Bosnyak-129 primary reference in Ground 2A is similar to the Bosnyak-392 primary reference in Ground 1A. That is, Bosnyak-129 is also focused on nanotube compositions for improved energy storage devices. (LGES-1006, para. [0131]). The nanotubes are obtained by exfoliating bundles of carbon nanotubes to produce individualized carbon nanotubes while maintaining the carbon nanotubes length as long as possible, i.e., a high aspect ratio, so that shorter nanotubes with a lower aspect ratio are avoided. In that vein, Bosnyak-129 states:

The exfoliated carbon nanotubes prepared by the techniques described hereinabove are typically **longer** than are carbon nanotubes exfoliated using existing technology. For instance, as described previously, other separation techniques result in carbon nanotube damage and shortened carbon nanotube lengths. **In certain applications, particularly those**

involving electrical conduction or mechanical reinforcement, shorter carbon nanotubes may not provide adequate electrical conductivity or structural reinforcement. For example, by having at least a portion of longer carbon nanotubes present with electrical devices such as energy storage device, a higher degree of connectivity at a carbon nanotube volume fraction can be obtained. Furthermore, **longer carbon nanotube lengths may increase the toughness of the polymer composites over those made with shorter carbon nanotubes.**

(LGES-1006, para. [0100]) (emphasis added). Bosnyak-129 further states regarding its full length carbon nanotubes:

In some embodiments, the exfoliated carbon nanotubes have an average length that is not substantially different than that of the bundled carbon nanotubes from which they are produced. That is, in some embodiments, **the carbon nanotubes are full length carbon nanotubes that are not shortened during exfoliation.** In some embodiments, the exfoliated carbon nanotubes are prepared from bundled carbon nanotubes, and **the exfoliated carbon nanotubes have a narrower distribution of lengths than do the bundled carbon nanotubes.** That is, **a subrange of exfoliated carbon nanotube**

lengths may be obtained from a population of bundled carbon nanotubes having a distribution of lengths.

(LGES-1006, para. [0099]) (emphasis added).

Given Bosnyak-129's focus on avoiding short nanotubes, a POSITA would not be motivated to modify it to add a large distribution of short nanotubes as independent claim 1 of the '282 Patent requires. More specifically, a POSITA would not deviate from the Bosnyak-129 teachings and employ a large portion of short nanotubes as Petitioner suggests in its Ground 2A combination with Albuerne. That is, reading Bosnyak-129 and its desire for long nanotubes there would be no reason that a POSITA would somehow employ a large amount (40%-90%) of short nanotubes with 30-70 aspect ratio and a lesser amount of longer nanotubes (1%-30%) with 80-140 average aspect ratio as in claim 1 of the '282 Patent. Petitioner does not explain why any or all of the Bosnyak-129 passages teaching against short nanotubes would be ignored by a POSITA to make the Petitioner's suggested combination. This is a first independent reason that Ground 2A fails.

Further, as explained below, the teachings of Albuerne would lead a POSITA away from a Bosnyak-129 combination. What's more, any such Bosnyak-129 and Albuerne combination even if made (which it would not be) would not yield independent claim 1. These are the second and third independent reasons why Petitioner's Ground 2A fails.

7. The Bosnyak-129 and Albuerne (LGES-1009) combination would not be made, nor would the proposed combination yield Independent Claim 1's bimodal aspect ratio or discrete requirements

Albuerne pertains to growing linear polystyrene chains from “two commercially available carbon nanotubes (MWCNTs) with similar diameter but different lengths.” (LGES-1009, abstract). Albuerne concludes that “the state of aggregation of the carbon nanotubes influence the grafting from polymerization reactions, where relative shorter and tightly aggregated carbon nanotubes promote higher polymerizations yields than longer and less aggregated carbon nanotubes.” (LGES-1009, abstract). In sum, Albuerne discloses and endorses aggregated nanotubes and not discrete nanotubes as claimed.

Albuerne is fundamentally different than Bosnyak-129 in two respects. *First*, Albuerne touts shorter nanotubes for “higher polymerization yields” (*Id.*), while Bosnyak-129 teaches against shorter nanotubes because “longer carbon nanotube lengths may increase the toughness of the polymer composites over those made with shorter carbon nanotubes.” (LGES-1006, para. [0100]). *Second*, Bosnyak-129 takes “advantage of physical properties offered by individual carbon nanotubes that are not apparent when the carbon nanotubes are aggregated into bundles.” (LGES-1006, para. [0095]). In direct contrast, Albuerne desires “tight aggregates” of nanotubes to “enhance the propagation of the growing polymer chain.” (LGES-1009, p.11, Conclusions). Petitioner does not, and cannot, explain why a POSITA would ignore

these fundamental differences as to the desired nanotubes to be used and somehow combine Bosnyak-129 and Albuerne.

Petitioner also does not explain or describe any connection between the compositions of Bosnyak-129 for energy storage (LGES-1006, para. [0131]) and Albuerne's use for "polymerization from the carbon nanotubes through the immobilization of a polymer precursor at the particle surface." (LGES-1009, p.1, bottom right column-p.2, top left column). Despite the lack of connection, Petitioner proposes using Albuerne's nitric acid treatment step with Bosnyak-129 "to achieve the well-known recognized benefit of an improved preservation of the carbon nanotubes' structures and lengths" and "to obtain predictable results of obtaining discrete oxidized carbon nanotubes having longer carbon nanotubes." (Petition, pp.48-49).

First, Petitioner does not explain why it is predictable. Albuerne itself notes the oxidation unpredictability stating, "[a] systematic study is required to understand the effect of the oxidation on identical MWCNTs exposed to mild and aggressive oxidation conditions." (LGES-1009, p.5, left column).

Second, if one obtained even longer carbon nanotubes than in Bosnyak-129 as Petitioner says would result using the Petitioner's suggested combination, then one would not obtain claim 1's mixture of aspect ratios:

(1) “40% to 90% by number of the discrete carbon nanotubes have an aspect ratio of 30-70”; and

(2) “1% to 30% by number of the discrete carbon nanotubes have an average aspect ratio of 80-140”

(LGES-1001, claim 1).

That is, Bosnyak-129’s preferred aspect ratio is “from about 60 to about 200” (LGES-1006, para. [0064]; *see also* para. [0100] (stating “the carbon nanotubes have a length to diameter ratio (aspect ratio) of least about 60 in some embodiments and at least about 100 in other embodiments.”)). If one lengthens the Bosnyak-129 nanotubes using the Petition’s stated rationale at page 49 for the combination with Albuerne of “having longer nanotubes,” then it would increase the aspect ratio even higher than 100 meaning that one would not achieve the limitation of claim 1 that “40% to 90% by number of the discrete carbon nanotubes have an aspect ratio of 30-70.” That is, if the nanotubes are lengthened, the numerator of the aspect ratio increases and therefore the aspect ratio increases (assuming the diameter is held constant, which is an assumption relied upon by Petitioner for this combination). (*See, e.g.*, Petition, p.22).

Third, in addition to the proposed nitric acid modification not obtaining the aspect ratio limitation, the proposed modification to use Albuerne would not yield discrete carbon nanotubes as claimed, but rather, aggregates. That is because the

Albuerne nanotubes are not discrete. This is confirmed by the fact that in order to obtain the Figure 5(b) that Petitioner replots and alleges shows the claimed aspect ratio on page 61 of the Petition, Albuerne had to disaggregate the bundled nanotubes to drop some on a measurement wafer. (See LGES-1009, p.6, bottom) (stating: “[t]he ultrasonic probe was used to disaggregate the carbon nanotubes before dropping the dispersion on the silicon wafer.”).

That the Albuerne nanotubes produced are not discrete and only less aggregated is further confirmed in Albuerne’s conclusion which states:

The MWCNT with relative tighter aggregates and with apparent shorter length ($\text{MWCNT}_{\text{BMS}}^{95}$) showed a higher polystyrene weight content than the relative longer, less aggregated carbon nanotubes ($\text{MWCNT}_{\text{FC}}^{99}$).

(LGES-1009, p.11, Conclusions).

Lastly, Petitioner relies solely on Figure 5’s length distribution and Petitioner’s re-plot of Figure 5 to somehow show the claimed aspect ratio on page 61 of the Petition; Petitioner’s reliance and argument are misplaced. First, Albuerne’s measured length distributions in Figure 5 were 370 ± 60 nm and 225 ± 30 nm, for $\text{MWCNT}_{\text{BMS}}^{95}$ and $\text{MWCNT}_{\text{FC}}^{99}$, respectively. (LGES-1009, p.6, left column). This varies widely from the supplier’s stated specifications of 1000-10,000 nm (1-10 μ m) and 5000-50,000 nm (5-50 μ m). (LGES-1009, p.1, abstract). Albuerne

says this is because “just the carbon nanotubes dispersed on the silicon wafers were taken into account for the measurements” even though “[l]onger carbon nanotubes are probably present on the samples included inside the aggregates.” (LGES-1009, p.6, left column). That the measured nanotubes were not representative of the sample is a first reason that Albuerne’s Figure 5 is not an actual or accurate length distribution that can be relied upon for obtaining an aspect ratio.

Adding further error to obtaining an actual and accurate length distribution, Albuerne used an ultrasonic probe “to disaggregate the carbon nanotubes.” (LGES-1009, p.6, left column). Albuerne states that this “ultrasonic treatment could induce the cleavage of the carbon nanotubes” (LGES-1009, p.6, right column) which means that the carbon nanotubes are cut and therefore shortened before the length measurement. For these reasons, Albuerne concedes its data is only useful for a “comparison” between the $\text{MWCNT}_{\text{BMS}}^{95}$ and $\text{MWCNT}_{\text{FC}}^{99}$ and merely “an indication of the length.” (LGES-1009, p.6, right column). Petitioner does not explain any of these deficiencies and therefore for all these reasons, Figure 5 cannot be relied upon as showing an accurate length distribution that can somehow correlate to an aspect ratio.

For at least the above-mentioned reasons, the Petitioner’s proposed combination in Ground 2A would not be made, and even if it was, then claim 1 of the ’282 Patent would not result. Ground 2A fails.

F. Petitioner Has Failed To Present A *Prima Facie* Case Of Obviousness

Petitioner's Grounds all rely upon obviousness as described above in Section II.E. A patent claim is unpatentable under 35 U.S.C. § 103 if the differences between the claimed subject matter and the prior art are such that the subject matter, as a whole, would have been obvious before the effective filing date of the claimed invention to a person having ordinary skill in the art to which said subject matter pertains. *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007). The question of obviousness is resolved by the factual determinations of four factors: (1) the scope and content of the prior art; (2) differences between the prior art and the claims at issue; (3) the level of ordinary skill in the pertinent art; and (4) when presented, objective evidence of nonobviousness, i.e., secondary considerations. *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966). Petitioner cannot satisfy its burden of proving obviousness by employing “mere conclusory statements,” but “must instead articulate specific reasoning, based on evidence of record, to support the legal conclusion of obviousness.” *In re Magnum Oil Tools Int'l, Ltd.*, 829 F.3d 1364, 1380 (Fed. Cir. 2016).

Here, Petitioner's obviousness case fails on the first two *Graham* factors (the scope and content of the prior art and differences between the prior art and the claims at issue). As described above in Sections II.E.1-7, the combinations of Bosnyak-392 and Son and Bosnyak-129 and Albuerne are deficient. The disclosures of the

references are such that even when combined, the combination fails to disclose the recited elements.

Furthermore, Petitioner has failed to present sufficient rationale to support the proposed combinations of references as described above. For example, as described above in Section II.E.1, Bosnyak-392 focuses on exfoliating bundles of carbon nanotubes to produce individualized carbon nanotubes while maintaining the carbon nanotubes length as long as possible, i.e., a high aspect ratio, so that shorter nanotubes with a lower aspect ratio are avoided. This is in contradiction to the claimed short nanotubes. Further, Petitioner's misstatements about the Bosnyak-392's disclosure further compound the deficiencies of the reference, and by extension, the alleged obviousness combination, whose deficiencies are described above in Sections II.E.2-5. Similar deficiencies abound with respect to the second combination relying primarily on Bosnyak-129, which similarly discloses maintaining the carbon nanotubes length as long as possible, i.e., a high aspect ratio, so that shorter nanotubes with a lower aspect ratio are avoided. Albuerne fails to cure this deficiency and, like Son, is fundamentally different in disclosure as detailed above in Section II.E.7.

Obviousness determinations must include “‘articulated reasoning with some rational underpinning to support the legal conclusion of obviousness.’” *KSR*, 550 U.S. at 418 (quoting *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006)). Here,

Petitioner, as described, may provide some articulated reasoning but any such reasoning lacks any rational underpinning as described above. Thus, a legal conclusion of obviousness cannot be supported here.

III. THE *FINTIV* FACTORS FAVOR DENIAL OF INSTITUTION UNDER § 314(a)

As detailed below, the *Fintiv* factors favor denial.³

A. Factor 1: A Stay Is Unlikely In the Parallel Proceeding

The first factor favors denial, or is at most neutral, because there is presently no stay in the parallel proceeding before the Eastern District of Texas. To be fair, Petitioner filed a motion to stay the litigation after filing this Petition. The motion was denied without prejudice to refile after institution decisions. *Molecular Rebar Design, LLC et al v. LG Energy Solution, Ltd.*, 2-24-cv-00107, ECF No. 60 (E.D. Tex. July 19, 2024) (MRD-2001).

Thus, if the Board declines to speculate on the possibility of a stay following institution, this factor is—at most—neutral. *Apple Inc. v. Fintiv, Inc.*, IPR2020-00019, Paper 15 at 12 (PTAB May 13, 2020). However, MRD notes that, at the institution stage, the case will be significantly into discovery, and the parties have expended significant resources, such as completing invalidity contentions and the

³As a threshold issue, Petitioner already addressed the factors in its Petition and should not be afforded an opportunity to reply to this response on this basis.

technical document production, and thus, this factor would shift to favoring denial. (See MRD-2002).

B. Factor 2: The Median Time To Trial Is Before The Deadline For A Final Written Decision

This factor favors denial because trial in the parallel district court proceeding is set for December 8, 2025 (MRD-2002), proximate an expected Final Written Decision if the IPR is instituted, as admitted by Petitioner. The proximity of these critical dates (i.e., the trial and a Final Written Decision) could result in conflicting decisions from the Board and the District Court, at nearly the same time, and the parties will then have to proceed to the Federal Circuit, which will face potentially inconsistent decisions with different records and different findings. Combining this inefficiency with the other factors discussed herein, the Board should exercise its discretion to deny institution. *Fintiv*, Paper 11 at 9 (“If the court’s trial date is at or around the same time as the projected statutory deadline, the decision whether to institute will likely implicate other factors...”).

C. Factor 3: The Parties Have Invested Significant Time And Money In The Parallel Proceeding

This factor strongly favors denying institution or is at most neutral. The parties are beginning to commit substantial resources to the parallel proceeding as discovery has begun in earnest, as noted above with respect to Factor 1. (See MRD-2002).

D. Factor 4: All Issues In The Petition Overlap With The Parallel Proceeding And The Parallel Proceeding

This factor favors denial because “the same or substantially the same claims, grounds, arguments, and evidence” in this Petition are also at issue in the parallel litigation. *Fintiv*, IPR2020-00019, Paper 11 at 12. Thus, addressing these same issues here would duplicate efforts. Petitioner’s stipulation “not to seek resolution in the district court of the same grounds presented in this Petition” in the parallel litigation for instituted claims rings hollow. (Petition, p.74) Petitioner has not offered to withdraw **all** grounds/combinations based on these references or that it reasonably could have raised—i.e., the full scope of estoppel if this IPR proceeds to final written decision. 35 U.S.C. §315(e)(2).

Petitioner’s proposed stipulation here is the same narrow stipulation criticized in *Sand Revolution*, and even narrower than the “intermediate ground between the stipulations in *Sotera* and *Sand Revolution*” that “precludes Petitioner from relying in the district court on any of the same *references* used in the Petition, and is not limited to only the same *grounds*.” *Ericsson Inc. v. Koninklijke KPN N.V.*, IPR2022-00069, Pap. 9 at 12-14 (PTAB May 25, 2022) (emphasis in original). Unlike a *Sotera* stipulation where “a petitioner stipulates not to pursue in a parallel district court proceeding the same grounds as in the petition **or any grounds that could have reasonably been raised in the petition**,” Petitioner’s proposed stipulation is limited only to the “same grounds” raised in the Petition and thus would not “mitigate[]

concerns of potentially conflicting decisions and duplicative efforts between the district court and the PTAB.” See Katherine K. Vidal, *Interim Procedure for Discretionary Denials in AIA Post-Grant Proceedings with Parallel District Court Litigation* (June 21, 2022) (“Vidal Memo”) at 7 (citing *Sotera*).

Further, Petitioner (as Defendant in the parallel litigation) has served extensive invalidity contentions. Petitioner’s narrow stipulation detailed above does nothing to narrow the case for the Court. Given the timing of the litigation, as discussed above in Factor 2, and that a stay is not likely (Factor 1), the Court is already forced to consider almost the full range of invalidity contentions served by Defendant that includes numerous invalidity references, and even more combinations, as the litigation proceeds to trial. (See MRD-2003, excerpts from invalidity contentions, served by Petitioner, as Defendant, in the parallel litigation showing the vast number of references relied upon). Thus, the Board spending its finite resources on this IPR, that will only resolve, at most, two grounds of the multitude of invalidity positions taken in the parallel litigation, is not judicially effective or efficient.

Thus, the Board should exercise its discretion to deny institution here where Petitioners’ proposed stipulation fails to cover the full scope of statutory estoppel.

E. Factor 5: The Parties In Both Proceedings Are The Same

This factor weighs in favor of denying institution because “petitioner and the defendant in the parallel proceeding are the same party.” *Fintiv*, IPR2020-00019, Paper 15 at 15; *see also SK Innovation Co., LTD v. LG Chem, LTD*, IPR2020-01239, Paper 14 at 20-21 (PTAB Jan. 12, 2021).

F. Factor 6: Petitioner’s Arguments Do Not Plainly Lead To A Conclusion Of Unpatentability

Given that the first five factors favor denial of institution, the Board must consider whether a compelling invalidity case is presented. *See, e.g., Commscope Technologies LLC v. Dali Wireless, Inc.*, IPR2022-01242, Paper 23 at 5 (PTAB Feb. 27, 2023). Critically, “the compelling merits standard is a higher standard than the standard for institution set by statute.” *Id.* at 3; *see also* Vidal Memo at 4 (“Compelling, meritorious challenges are those in which the evidence, if unrebutted in trial, would plainly lead to a conclusion that one or more claims are unpatentable by a preponderance of the evidence.”); *Vector Flow, Inc. v. HID Glob. Corp.*, IPR2023-00353, Paper 8 at 25 (PTAB July 17, 2023) (“A conclusion of unpatentability cannot ‘plainly’ follow from an analysis that declines to offer nothing more than ‘possibilities’ as how the claims might be understood.”); *see also* Vidal Memo at n.6.

Here, Petitioner does not present a compelling invalidity challenge sufficient to outweigh the preceding five factors as MRD has demonstrated herein. Petitioner’s

Grounds all rely upon obviousness. Petitioner has done exactly what the Board noted in *Vector Flow* is insufficient—offer nothing more than possibilities and assumptions on how the cited art might be combined given the lack of disclosure of recited elements and lack of rationale to combine. As described above in Sections II.E1 to 11.E.7, the combination of cited art presented in each Ground by Petitioner fails to present a *prima facie* case of obviousness. Given this, Petitioner does not even meet the reasonable likelihood of success standard for institution (as explained above), and therefore it cannot meet the significantly higher standard for a compelling invalidity challenge.

Accordingly, this factor favors denying institution.

IV. CONCLUSION

The Board should deny institution.

Dated: September 17, 2024

Respectfully Submitted,
/Gregory L. Porter/
Gregory L. Porter
Registration No. 40,131
Lead Counsel for Patent Owner

CERTIFICATE OF WORD COUNT

The undersigned certifies pursuant to 37 C.F.R. § 42.24(d) that the foregoing Patent owner Preliminary Response excluding any table of contents, table of authorities, certificates of service or word count, or appendix of exhibits or claim listing, contains 7,684 words according to the word-processing program used to prepare this paper (Microsoft Word). Petitioner certifies that this Patent Owner Preliminary Response does not exceed the applicable type-volume limit of 37 C.F.R. § 42.24(b)(1); that is, a 14,000 word limit.

Dated: September 17, 2024

Respectfully Submitted,
/Gregory L. Porter/
Gregory L. Porter
Registration No. 40,131
Lead Counsel for Patent Owner

CERTIFICATE OF SERVICE

Pursuant to 37 C.F.R. § 42.6(e)(4), lead counsel for Patent Owner hereby certifies that on September 17, 2024, a copy of this PATENT OWNER'S PRELIMINARY RESPONSE was served to the email correspondence addresses of record for Petitioner's counsel of record:

IPR18768-0210IP8@fr.com

PTABInbound@fr.com

Dated: September 17, 2024

Respectfully Submitted,
/Gregory L. Porter/
Gregory L. Porter
Registration No. 40,131
Lead Counsel for Patent Owner