

**UNITED STATES PATENT AND TRADEMARK OFFICE**

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**BEFORE THE PATENT TRIAL AND APPEAL BOARD**

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LG Energy Solution, Ltd.,  
Petitioner,

v.

Molecular Rebar Design, LLC,  
Patent Owner.

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IPR2024-01006  
Patent 8,808,909

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**PATENT OWNER'S PRELIMINARY RESPONSE  
TO PETITION FOR *INTER PARTES* REVIEW OF  
U.S. PATENT NO. 8,808,909**

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**EXHIBIT LIST**

| <b>Exhibit No.</b> | <b>Description</b>                                                                                                                                                                           |
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| 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           | Micah J. Green, “Analysis and measurement of carbon nanotube dispersions: nanodispersion <i>versus</i> macrodispersion.” <i>Polym Int</i> 2010; 59; 1319-1322                                |
| MRD-2004           | Excerpts from Defendants’ P.R. 3-3 Invalidity Contentions in parallel civil suit in EDTX                                                                                                     |
| MRD-2005           | H. Golnabi, “Carbon nanotube research developments in terms of published papers and patents, synthesis and production,” <i>Scientia Iranica</i> , Vol. 19, Issue 6, Dec. 2012, pp. 2012-2022 |

## **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. 8,808,909 (the “’909 Patent”). The ’909 Patent is related to (1) U.S. Patent No. 8,968,924 which is the subject of IPR2024-1011 and (2) U.S. Patent No. 10,153,483 which is the subject of IPR2024-1013. Petitioner is the same in all three IPRs and applies the same Ohata-Kavan combination in the related patent IPRs as it applies here. As described below, 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.

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

## **II. PETITIONER’S SUGGESTED COMBINATIONS FAIL TO RENDER THE SOLE INDEPENDENT CLAIM OBVIOUS**

As discussed below, none of the grounds teach or suggest, either alone or in combination, each limitation of independent claim 1, the only independent claim in the ’909 Patent. Accordingly, the Board should deny instituting this IPR.

**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 '909 Patent to the extent necessary to respond to constructions proposed by Petitioner or as required to respond to the facts or circumstances.

**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.4).

**C. The '909 Patent**

The '909 Patent relates to compositions for lithium ion batteries. The only independent claim, claim 1, requires:

- “discrete carbon nanotubes”;
- wherein the discrete carbon nanotubes have “crystals or layers of lithium ion active material attached to their surface”;
- “wherein the discrete carbon nanotubes have an aspect ratio of 10 to 500”;
- and
- wherein the discrete carbon nanotubes have “oxidation levels from 1 % to 15% by weight of the carbon nanotube.”

**D. The Cited References And Asserted Combinations Do Not Render Any Independent Claim Obvious**

The Petition alleges two primary invalidity grounds, comprising three total grounds, covering claims 1-8. *Ground 1* is based on the alleged obviousness of claims 1-2 and 5-8 over Ohata and Kavan; *Ground 2A* is based on the alleged obviousness of claims 1-2 and 5-8 over Lee and Wepasnick; and *Ground 2B* is based on the alleged obviousness of claims 3 and 4 over Lee, Wepasnick, and Zhamu.

Claim 1 is the only independent claim at issue and this response will focus on Grounds 1 and 2A that relate to claim 1. Also, because Ground 2A fails to show why independent claim 1 is obvious, Ground 2B similarly fails to show the obviousness of claims 3 and 4 depending therefrom.

**1. The primary reference of Ohata (LGES-1004) in the Ohata-Kavan combination of Ground 1 discloses a fundamentally different composition than independent Claim 1's composition**

The Ohata primary reference discloses a fundamentally and materially different composition than the composition recited in independent claim 1 of the '909 Patent. The thrust of Ohata is to use a masterbatch process with unoxidized nanotubes and resin when preparing an electrode to reduce the amount of conductive material in the electrode which allegedly results in improved electrode capacity:

[0060] [T]he use of a masterbatch process can reduce the amount of conductive material in an electrode, resulting in a greatly improved electrode capacity. In addition, since carbon nanotubes are used as a

conductive material, the conductive paths are not damaged by shearing force, which is applied during the production of the masterbatch.

[0061] Furthermore, the use of carbon nanotubes as a conductive material improves the strength of an electrode plate, providing a secondary battery with an improved cycle life.

(LGES-1004, paras. [0060]-[0061]).

Ohata's masterbatch is made by first mixing the unoxidized carbon nanotubes and a resin. (LGES-1004, abstract). The unoxidized nanotubes have an "aspect ratio of not less than 100" and "preferably not greater than 1000." (*Id.*, para. [0020]). Ohata's resin is a fluorocarbon resin. (*Id.*, para. [0022]). An electrode active material is then added to the masterbatch, and steps are performed to make electrodes from the starting masterbatch. (*Id.*, abstract).

As described by Petitioner, Ohata provides the starting point of the Ground 1 Ohata-Kavan combination:

The Ohata-Kavan combination composition uses Ohata as a starting point. LGES-1003, ¶33. An "electrode material mixture containing the masterbatch and an electrode active material" is blended with "a dispersion medium" to form "[a]n electrode material mixture paste." LGES-1004, [0023]. The masterbatch contains nanotubes dispersed in a resin, where the aspect ratio of the nanotubes and the ratio of nanotubes

to electrode active material are as taught by Ohata. *See id.*, [0015], [0020], [0024]; LGES-1003, ¶33.

(Petition, p.7).

**a. Ohata fails to disclose three fundamental requirements of Independent Claim 1**

Petitioner is forced to suggest that Ohata be combined with Kavan because Ohata does not teach or suggest at least three fundamental requirements of independent claim 1:

- oxidized nanotubes with “oxidation levels of from 1% to 15%”;
- nanotubes “having crystals or layers of lithium ion active material attached to their surface”; or
- the required “lithium ion active material”.

In addition to Ohata missing these three key limitations, Petitioner’s reliance on Ohata somehow teaching or suggesting the ’924 Patent’s claimed aspect ratio of “10 to 500” is misplaced. Ohata teaches an aspect ratio of “not less than 100” explaining, “When the aspect ratio is too small, excellent conductive paths may not be formed in some electrodes.” (LGES-1004, para. [0020]). Petitioner does not explain how or why a person of ordinary skill would deviate from Ohata’s “not less than 100” aspect ratio that achieves “excellent conductive paths” to somehow employ the claimed range that goes as low as 10 in the “10-500” aspect ratio recited in independent claim 1.

And, because this is an obviousness combination, rather than anticipation based on Ohata, the issue is not whether an overlapping range is disclosed by Ohata, but what the resulting combination discloses. As described above, Ohata warns about going below an aspect ratio of 100 and its impact on lack of “excellent conductive paths.” This impacts the lower end of the claimed range (i.e., 10-100).

Further, given that Ohata discloses non-oxidized carbon nanotubes and Kavan discloses oxidized carbon nanotube, to supposedly meet the recited element, Petitioner alleges the resulting nanotubes of the combination will be oxidized. But oxidation is known to shorten the nanotubes. (*See, e.g.*, Petitioner’s cited reference LGES-1009, Abstract) (stating oxidation using “nitric acid treated material under reflux conditions suffered the highest degree of degradation, such as, nanotube shortening and additional defect generation in the graphitic network.”).

Since aspect ratio is based the length to diameter ratio (Petition, p.25), shortening nanotubes length via oxidation as Petitioner proposes would necessarily decrease the nanotube aspect ratio in the proposed combination. Petitioner relies solely upon Ohata’s disclosure (table 2) regarding aspect ratio for the combination. (Petition, pp.25-26).

Petitioner’s suggestion to oxidize Ohata’s nanotubes based on Kavan will reduce the aspect ratio below 100 since oxidation reduces length, and having an aspect

ratio below 100 is something that Ohata warns about because “excellent conductive paths may not be formed in some electrodes.” (LGES-1004, para. [0020]).

Petitioner has not explained why a POSITA would ignore Ohata’s warning nor has Petitioner provided evidence that the resulting combination will perform as Petitioner alleges. And this is critical since chemical arts have a degree of unpredictability, which has been long recognized. *See, e.g., In re Carelton*, 599 F.2d 1021, 1026 (C.C.P.A. 1979) (“Although there is a vast amount of knowledge about general relationships in the chemical arts, chemistry is still largely empirical, and there is often great difficulty in predicting precisely how a given compound will behave.”). Petitioner fails to address this issue. “If the prior art discloses its own range, rather than a specific point, then the prior art is only anticipatory if it describes the claimed range with sufficient specificity such that a reasonable fact finder could conclude that there is no reasonable difference in how the invention operates over the ranges.” *Ineos USA LLC v. Berry Plastics Corp.*, 783 F.3d 865, 869 (Fed. Cir. 2015).

This is yet another reason Petitioner’s Ground 1 is flawed as explained in more detail below.

**b. Petitioner fails to explain how Ohata’s aspect ratio would be retained based on the proposed modifications**

In addition to not accounting for nanotube shortening due to oxidation, Petitioner also does not explain why a person of ordinary skill in the art would somehow try to retain Ohata’s aspect ratio in the combination (Petition, pp. 7-8) even

though Petitioner suggests changing Ohata's fundamental electrode chemistry by modifying three other key aspects of Ohata, i.e., the (1) unoxidized nanotubes that (2) do not have ion active material attached to a nanotube surface, and (3) the electroactive material.

Ohata's aspect ratio is directly related to the unoxidized carbon nanotube performance in Ohata's electrode as it is these unoxidized carbon nanotubes that are used as conductive material (LGES-1004, paras. [0060]-[0061]). As Ohata explains, when Ohata's aspect ratio is too small ( $<100$ ), the conductive path is adversely affected (*Id.*, para. [0020]). Petitioner has not explained why a person of ordinary skill in the art would try to retain Ohata's nanotube aspect ratio and expect success when the conductive path is altered by substituting chemically different nanotubes, i.e., shortened oxidized nanotubes with a smaller aspect ratio due to oxidation, while also substituting Ohata's electroactive material with something else that Ohata does not contemplate.

The fact that Ohata's "not less than 100" disclosed aspect ratio would lead a person of ordinary skill away from the claimed lower limit of 10 is reason enough alone to find that Ground 1 fails. Petitioner's lack of explanation for somehow retaining Ohata's aspect ratio in its suggested combination (even though Petitioner's proposed oxidation would necessarily reduce the aspect ratio) while also suggesting to

fundamentally change Ohata's electrode chemistry is a second independent reason why the Ohata-Kavan combination in Ground 1 fails.

**2. Petitioner's suggested substitutions to modify Ohata based on Kavan (LGES-1005) lack proper rationale**

Petitioner is forced to look to Kavan because, as noted above in Section II.E.1a, Ohata does not teach or suggest at least three fundamental requirements of independent claim 1:

- oxidized nanotubes with "oxidation levels of from 1% to 15%";
- nanotubes "having crystals or layers of lithium ion active material attached to their surface"; or
- the required "lithium ion active material".

Kavan generally pertains to a study "carried out to investigate composite materials in which multi-walled carbon nanotubes, either pristine or functionalized by carboxyls, were interfaced to three different materials, viz. TiO<sub>2</sub>, LiMnPO<sub>4</sub> and LiFePO<sub>4</sub>." (LGES-1005, p.9, left column). Petitioner suggests modifying Ohata's masterbatch by alleging: "the nanotubes used in preparation of the masterbatch (*see* LGES-1004, [0015]) are functionalized, e.g., "by carboxylic groups," as taught by Kavan . . . ." (Petition, p.7). Petitioner also suggests substituting Ohata's electrode material by alleging based on Kavan, "the negative electrode material mixture paste

incorporates titania (TiO<sub>2</sub>) . . . Alternatively, a positive electrode material mixture paste incorporates a phosphate olivine . . . .” (Petition, p.8).

As an initial matter, Petitioner’s Ohata-Kavan combination is deficient on its face. Petitioner does not make any attempt in its 84 page Petition or its 53 exhibits to present any evidence or even allege that Ohata’s nanotubes shortened by Kavan’s oxidation to a low aspect ratio somehow would be or could be compatible in Ohata’s masterbatch. Nor does the Petition discuss how to even oxidize the small amount of nanotubes present in Ohata’s large masterbatch. The Board need look no further than these fundamental deficiencies to deny institution of Ground 1.

What’s more, as explained below, Petitioner’s rationale for each of its proposed substitutions from Ohata into Kavan is deficient.

**a. Petitioner’s rationale to try and oxidize nanotubes in Ohata’s masterbatch is deficient and Ground 1 fails for at least this reason**

Petitioner states its first reason to try and oxidize nanotubes in Ohata’s masterbatch is because a “POSITA would have been motivated to use oxidized nanotubes together with TiO<sub>2</sub> such that the combination paste would enjoy fast electrochemical charge transfer.” (Petition, p.9). First, this reasoning to use oxidized nanotubes is circular because TiO<sub>2</sub> is what Petitioner proposes substituting into Ohata. Second, the Petition does not explain why a POSITA would oxidize nanotubes given that Kavan teaches “that the oxidative functionalization is not necessary for anchoring

to TiO<sub>2</sub>, because the pristine MWNT behave similarly [15].” (LGES-1005, p.2). Further, Kavan also teaches that for the oxidized nanotubes, “The Li-storage capacity of TiO<sub>2</sub> is not enhanced in the composite . . . .” (*Id.*, p.9). These Kavan teachings are not addressed by Petitioner and in light of these a POSITA would not be led to make oxidized nanotubes. Thus, Petitioner’s primary reason to oxidize Ohata’s nanotubes based on Kavan fails.

Petitioner says a second reason to use oxidized nanotubes in Ohata is that they “exhibit better affinity towards TiO<sub>2</sub> than do unoxidized nanotubes.” (Petition, p.9). This “reasoning” to use oxidized nanotubes is again circular because TiO<sub>2</sub> is what Petitioner is proposing to substitute into Ohata. Further, Kavan teaches “that the oxidative functionalization is not necessary for anchoring to TiO<sub>2</sub>, because the pristine MWNT behave similarly [15].” (LGES-1005, p.2). Second, Petitioner also ignores that Kavan teaches that for the oxidized nanotubes, “The Li-storage capacity of TiO<sub>2</sub> is not enhanced in the composite . . . .” (*Id.*, p.9). An alleged “better affinity” without associated performance results is not an appropriate rationale to add some oxidation step that the Ohata primary reference does not contemplate and Kavan teaches is unnecessary. Therefore, Petitioner’s second reason is deficient.

As a third purported reason to use oxidized nanotubes in Ohata, Petitioner speculates that, “when the combination paste is instead a positive electrode material mixture paste having a phosphate olivine as the active material (*see* LGES-1005, p.2),

electrochemical performance of an electrode is improved by oxidized nanotubes.” (Petition, p.9). However, Ohata’s masterbatch does not have a phosphate olivine as the active material. Instead, phosphate olivine is an electrode material that Petitioner proposes substituting into Ohata as a positive electrode material. (Petition, p.12). Thus, Petitioner’s third alleged reason for the purported motivation to oxidize nanotubes is circular.

Petitioner next says for its fourth alleged combination reason, “a POSITA would have been motivated to use oxidized nanotubes because, at least in some cases, doing so is consistent with, and can enhance, Ohata’s goal of dispersed nanotubes in the masterbatch.” (Petition, pp.10-11) (emphasis added). First, Petitioner does not explain why only in some cases oxidizing a masterbatch enhances dispersion. Nor does Petitioner say whether or not this combination is one of the cases. Second, Ohata nowhere suggests it is in need of better dispersion and instead says that its unoxidized nanotubes “form an excellent conductive path” and that the resin with dispersed nanotubes “serves to increase the mechanical strength.” (LGES-1004, paras. [0016]-[0017]). Despite this being an unpredictable art, Petitioner does not explain whether or how its proposed substitution could or would affect these key properties that Ohata touts. Indeed, using shortened nanotubes due to oxidation would lead to a lower aspect ratio which Ohata explains adversely effects the conductive path. (*Id.*, para. [0020]). This purported rationale is deficient.

Petitioner's fifth purported reason to combine brings a third reference, Wepasnick (LGES-1010), into the combination. Petitioner rationalizes based on that reference that "oxidative treatments can 'remove amorphous carbon and metallic impurities, thus leading to a higher-purity starting material.'" (Petition, p.11).<sup>1</sup> However, Ohata does not suggest anywhere that amorphous carbon or metallic impurities are present in its unoxidized nanotubes and the Petition does not speculate that either. Thus, this purported reason is without any foundation.

Petitioner's sixth, and final, reason for trying to oxidize Ohata's masterbatch is the catch-all of applying known techniques to a known structure to yield predictable results. (Petition, p.11). But Petitioner's final conclusory reason does not explain any of the following:

- how one can oxidize the small amount of nanotubes in Ohata's masterbatch of resin without the oxidizing agent reacting with or harming Ohata's other ingredients; or
- whether nanotubes shortened by Kavan's oxidation to a low aspect ratio somehow would be or could be compatible in Ohata's masterbatch.

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<sup>1</sup> This same reference also states, "[f]urthermore, the effect of different oxidizing conditions on CNT surface chemistry or structure is seldom considered." (LGES-1010, p.2).

Thus, this catch-all reason for Ground 1's combination is deficient.

All of Petitioner's "reasons" to try and oxidize nanotubes in Ohata's masterbatch are deficient and Ground 1 fails for this additional reason. As described below, Petitioner's rationale as to substituting Ohata's electrode material with some Kavan material like TiO<sub>2</sub> or Petitioner's alternative theory to substitute Kavan's phosphate olivine in Ohata are just as deficient.

**b. Petitioner's rationale to substitute TiO<sub>2</sub> for Ohata's electrode material is deficient and Ground 1 fails for at least this additional reason**

Citing to Kavan, Petitioner says the first purported motivation to use TiO<sub>2</sub> of Kavan instead of Ohata's electrode material is because TiO<sub>2</sub> is "among "the top interesting host structures for lithium insertion." (Petition, p.12). Petitioner's quote is from Kavan's introduction explaining its rationale for its TiO<sub>2</sub> study. Petitioner ignores and does not explain Kavan's follow-on observation as a result of its study that, "the host structure itself (TiO<sub>2</sub>) is poorly conducting at these conditions (potentials)." (LGES-1005, p.5, right column). Further, Kavan also teaches that, "The Li-storage capacity of TiO<sub>2</sub> is not enhanced in the composite . . . ." (*Id.*, p.9). These Kavan disclosures are not addressed by Petitioner, and in light of these, a POSITA would not be led to make the proposed substitution.

Petitioner next says that the combination would be made because the TiO<sub>2</sub> composite shows some "unique faradaic pseudocapacitance". (Petition, p.13).

However, the paragraph from Kavan cited in support observes, “[t]he Li-storage capacity of TiO<sub>2</sub> is not enhanced in the composite . . . .” (LGES-1005, p.9). What’s more, the Petition does not explain why any alleged “unique faradaic pseudocapacitance” is somehow beneficial. In addition, as Kavan observes this faradaic pseudocapacitance pertains only to composites with oxidized nanotubes as it is “only for the interaction of functionalized MWNT-ox with the titania surface.” (*Id.*, p.9). As explained above, a POSITA would not even oxidize nanotubes in materials having TiO<sub>2</sub> given that Kavan teaches “that the oxidative functionalization is not necessary for anchoring to TiO<sub>2</sub>, because the pristine MWNT behave similarly [15].” (*Id.*, p.2). Further, Kavan also teaches that for the oxidized nanotubes, “[t]he Li-storage capacity of TiO<sub>2</sub> is not enhanced in the composite . . . .” (*Id.*, p.9). Thus, there are numerous reasons that Ohata and Kavan would not be combined that Petitioner has ignored and not explained.

Petitioner’s third through sixth reasons for allegedly using TiO<sub>2</sub> in Ohata bring a third and fourth reference (LGES-1033 (Pfanzelt) and LGES-1040 (Deng)) into the Ohata-Kavan combination and rationalizes that, based on those references, TiO<sub>2</sub> has (1) “desirable electrochemical performance”, (2) makes “structurally durable” electrodes, (3) are safe, (4) and are inexpensive. (Petition, p.13). However, neither of these added references make any reference to using TiO<sub>2</sub> with carbon nanotubes and, in fact, neither mentions carbon nanotubes at all. Moreover, Petitioner does not allege

(and Ohata does not express) that Ohata's electrode material has any problem with performance, durability, safety, or expense.

To the contrary, Ohata expressly states, and Petitioner does not dispute, that Ohata already has a "greatly improved electrode capacity." (LGES-1004, para. [0060]). Petitioner offers no evidence that a POSITA would expect its suggested combination to offer an advantage over Ohata in any material respect. Thus, Petitioner's reasons 3-6 to make the alleged substitution are illusory and deficient.

Petitioner's seventh reason is the catch-all of applying known techniques to a known structure to yield predictable results. (Petition, p.14). Petitioner's conclusory reason does not explain any of the following:

- how one can oxidize the small amount of nanotubes in Ohata's masterbatch of resin without the oxidizing agent reacting with or harming Ohata's other ingredients; or
- whether nanotubes shortened by Kavan's oxidation to a low aspect ratio somehow would be or could be compatible in Ohata's masterbatch.

Thus, this catch-all reason for Ground 1's combination is also deficient.

All of Petitioner's "reasons" to try and use TiO<sub>2</sub> in Ohata's masterbatch are deficient and Ground 1 fails for this additional reason. Realizing the weakness of its suggestion to use Kavan's TiO<sub>2</sub> in Ohata, Petitioner alternatively proposes using Kavan's phosphate olivine, which also fails as discussed below.

**c. Petitioner's rationale to substitute phosphate olivine for Ohata's electrode material is deficient and Ground 1 fails for at least this additional reason**

Petitioner says the purported motivation to use the phosphate olivine of Kavan instead of Ohata's electrode material is "because of their good electrochemical performance when combined with oxidized nanotubes, as described by Kavan." (Petition, p.14). But Ohata does not have oxidized nanotubes. Instead, Ohata employs unoxidized nanotubes and the oxidized nanotubes are what Petitioner proposes substituting into Ohata. Thus, Petitioner's primary reasoning is circular.

Petitioner then speculates in reasons 2-4 that phosphate olivines would be substituted for Ohata's electrode material because they are safe, economical, and environmentally friendly. (Petition, pp.14-15). Petitioner cites to Kavan (LGES-1005) page 1 support but does not provide the full quote. However, the full quote from that page of Kavan is as follows:

They are promising cathode materials for Li-ion batteries due to high safety, low cost and environmental tolerability. However, their poor electrical conductivity is a crucial issue to be addressed [28] either by doping [29] or by surface coating with elemental carbon [30,31].

(LGES-1005, page 1) (emphasis added). Petitioner does not explain how or why in the absence of hindsight that a person of ordinary skill in the art would ignore that

“crucial issue” of “poor electrical conductivity” and follow though with its proposed combination.

In addition to the above unaddressed electrical conductivity disadvantage with phosphate olivines, Petitioner does not allege and Ohata does not express that Ohata’s electrode material has any problem with safety, economics, or environmental issues. Thus, Petitioner’s reasons 2-4 to make the alleged phosphate olivine substitution are deficient.

Petitioner’s fifth reason for the alleged combination brings a third and fourth reference (LGES-1041 (Chen) and LGES-1042 (Feng)) into the combination and rationalizes based on those references that phosphate olivines have “good electrochemical performance.” (Petition, p.15). However, that purported reason is directly contradicted by the Kavan reference (which recall is the secondary reference basis of the combination), which states that the phosphate olivine’s “poor electrical conductivity is a crucial issue to be addressed [28] either by doping [29] or by surface coating with elemental carbon [30,31].” (LGES-1005, page 1). Thus, this fifth reason, like the others, fails.

Petitioner’s sixth, and final reason, is the catch-all of applying known techniques to a known structure to yield predictable results. (Petition, p.15). Petitioner’s conclusory reason does not explain any of the following:

- how one can oxidize the small amount of nanotubes in Ohata's masterbatch of resin without the oxidizing agent reacting with or harming Ohata's other ingredients; or
- whether nanotubes shortened by Kavan's oxidation to a low aspect ratio somehow would be or could be compatible in Ohata's masterbatch.

Thus, this catch-all reason for Ground 1's combination is also deficient.

All of Petitioner's "reasons" to try and use phosphate olivine in Ohata's masterbatch are deficient and Ground 1 fails for this additional reason.

**d. Petitioner does not explain how the "attached" limitation of independent claim 1 is met by the Ohata-Kavan combination**

Independent claim 1 of the '909 Patent requires discrete nanotubes "having crystals or layers of lithium ion active material attached to their surface." Because Ohata lacks this limitation, Petitioner looks to modify Ohata with Kavan to somehow meet it. It fails to do so.

First, the Petition does not explain how the use of Ohata's masterbatch could somehow result in crystals or layers of lithium ion active material attached to discrete nanotubes. That is, the masterbatch only has a small amount of nanotubes in a large amount of resin (LGES-1004, para. [0021]), and the amount of nanotubes is even smaller "not greater than 0.8 parts by weight" in the electrode (*Id.*, para. [0024]). Petitioner does not explain what steps would be used in such a masterbatch process

that could result in “crystals or layers of lithium ion active material attached” to the surface of discrete carbon nanotubes.

Second, Ohata teaches that a resin is typically added to the electrode material mixture which “may be the same resin as or a resin analogous to the one used during the production of the masterbatch, or a resin other than the above. In order to obtain a high-capacity electrode, the resin to be added is preferably particulate rubber that enables spot bonding between the active material particles.” (LGES-1004, para. [0023]) (emphasis added).

Petitioner nowhere mentions Ohata’s spot bonding and therefore does not account in any way for Ohata’s active material particles being spot bonded to each other for the stated advantage of obtaining “a high-capacity electrode.” That is, why would an ordinarily skilled artisan modify Ohata to attach ion active material particles to the surface of a discrete carbon nanotubes as claimed instead of the active material particles being attached to each other as expressly taught in Ohata. The Petition does not provide any explanation for this because there is none.

In alleging the combination meets the “attached” limitation, Petitioner must first assume that the substitutions of the oxidized nanotubes and TiO<sub>2</sub> or phosphate olivine would be made (which they would not be as discussed above). Petitioner speculates that, “[b]ased on Kavan, the nanotubes in the combination electrode material paste have TiO<sub>2</sub> nanocrystals (**crystals of lithium ion active material**) attached to their

**surface.”** (Petition, p.23) (emphasis in original). Similarly, in regard to “phosphate olivine” Petitioner speculates that, “based on Kavan, the nanotubes in the combination electrode material paste have phosphate olivine crystals (crystals of ion active material) attached to their surface.” (Petition, p.25). However, Kavan does not say either material is attached.

What Kavan actually states is that “surface oxidation of carbon nanotubes by  $\text{HNO}_3$  [6,8,10,15,16,32,37,41,44],  $\text{H}_2\text{SO}_4/\text{HNO}_3$  [4] or  $\text{H}_2\text{O}_2$  [9], producing among other groups also carboxyls, was sometimes mentioned to improve the anchoring of  $\text{TiO}_2$  [4,6,8–10,15,16,44] or  $\text{LiMPO}_4$  [32,37,41].” (LGES-1005, p.2) (emphasis added).

In addition to the anchoring only being “sometimes mentioned,” Kavan does not teach or suggest that any such anchoring is to a surface of a discrete carbon nanotube. Nor does Kavan teach or suggest that any such anchoring could or would occur in a masterbatch such as Ohata wherein there are only a small amount of carbon nanotubes present when an electrode material is combined in the masterbatch. And the Petition fails to account for any masterbatch when making its conclusory allegations about the suggested combination meeting the aforementioned “attached” limitation.

Further, in regard to oxidative functionalization and anchoring TiO<sub>2</sub>, Kavan states:

However, there are also reports that the oxidative functionalization is not necessary for anchoring to TiO<sub>2</sub>, because the pristine MWNT behave similarly [15]. The interaction of carboxyls with phosphate olivine surface is less understood, but certainly important, too [45,46]. To the best of our knowledge, there is no systematic study of these contradictory issues, although detailed understanding is desirable of the MWNT functionalization (by surface oxidation forming carboxyls) for optimum attachment of MWNT towards titania or olivine surfaces.

(LGES-1005, p.2) (emphasis added). Petitioner's speculation relies on Kavan's teachings (Petition, p.25), but Kavan is uncertain as to any carbon nanotube attachment. Kavan instead calls for a systematic study to understand the interaction between carboxyls and the electrode material. Petitioner's speculation about the "attachment" limitation does not meet the preponderance burden Petition must show. This is an additional reason Ground 1 fails.

Further, Petitioner does not prove that there are discrete carbon nanotubes in the Ohata-Kavan combination as explained below.

e. **Petitioner wrongly alleges that any “generally uniformly dispersed” nanotubes inherently include “discrete carbon nanotubes”**

The Petition only states in regard to the “discrete” limitation:

[T]o the extent **discrete** is interpreted as referring to nanotubes that are generally individually distinct, a POSITA would have found it obvious that at least some of these “unraveled and straightened carbon nanotubes” are **discrete** because they are generally “dispersed” as individual nanotubes in the resin, as described and illustrated by Ohata. LGES-1004, [0017]; *see* LGES-1001, 3:52-54; LGES-1003, ¶69.

(Petition, p.20) (emphasis in original). It appears Petitioner is somehow alleging (without actually saying so and critically, without evidence) that any “generally uniformly dispersed” nanotubes somehow inherently include “discrete carbon nanotubes.” This is not true.

*First*, Ohata does not use the Petition’s term in the quote above of “individual, distinct nanotubes (separated into individual tubes) in the resin” as stated in the quotation from Petitioner’s p.20 quote above.

*Second*, the oxidized nanotubes of Kavan that Petitioner proposes using are not discrete, but rather, are highly entangled as shown in Kavan Figure 2 upper right and Figure 3. (LGES-1005, pp.2-3).

*Third*, a person of ordinary skill understands that aggregates of dispersed non-discrete carbon nanotubes may be generally uniformly dispersed. *See, e.g.*, Micah J. Green, “Analysis and measurement of carbon nanotube dispersions: nanodispersion *versus* macrodispersion.” *Polym Int* 2010; 59; 1319-1322 (defining macrodispersion as “the dispersion of small CNT bundles” and stating that researchers may use “well dispersed” to “mean a lack of large nanotube aggregates, i.e. macrodispersion.”) (MRD-2003, p.1).

Thus, contrary to Petitioner’s misunderstanding, “generally uniformly dispersed” nanotubes do not have to include “discrete” carbon nanotubes as claimed. This is yet another independent reason to deny institution of Ground 1 that relies on the deficient Ohata-Kavan combination.

**3. The primary reference of Lee (LGES-1006) in the Lee-Wepasnick combination of Ground 2A discloses a fundamentally different composition than independent Claim 1’s composition**

The Lee primary reference discloses a fundamentally and materially different composition than the composition recited in independent claim 1 of the ’909 Patent. The thrust of Lee is to use an anode active material “that includes secondary particles formed of agglomerated primary nanoparticles. The primary nanoparticles include a non-carbonaceous material bound with hollow carbon nanofibers.” (LGES-1006, abstract; *see also* disclosure of 11 other mentions of “agglomerated” or “agglomerations” of nanoparticles throughout Lee). In contrast to the Lee primary

reference in the combination wherein nanotubes in the anode are expressly “agglomerated”, independent claim 1 of the ’909 Patent requires “discrete carbon nanotubes.” (LGES-1001, p.9).

Petitioner construes “discrete” as “generally individually distinct (*e.g.*, non-agglomerated) nanotubes.” (Petition, p.53; *see also* pp. 20, 22, 34, and 54). Thus, the Lee anode with agglomerated nanotubes are fundamentally different from the “discrete carbon nanotubes” of independent claim 1 even under Petitioner’s own proposed “discrete” construction. This is a first independent reason that the primary reference is fundamentally different and the suggested combination with Wepasnick would not yield independent claim 1.

Second, the Lee composition is different from the composition of independent claim 1 of the ’909 Patent in a second fundamental aspect in that Lee does not use nanotubes with “oxidation levels from 1% to 15%” as claimed. Instead, Lee does not oxidize its carbon nanotubes, as admitted by Petitioner in bringing in a secondary reference to allegedly cure this deficiency. (Petition, p.42). Petitioner is forced to try and combine Lee’s fundamentally different anode with agglomerated, and unoxidized nanotubes with Wepasnick in a strained manner that would not yield claim 1 and further would not be combined by a POSITA, as described below. (*Id.*, pp.42-44).

As a third fundamental difference between Lee and ’909 independent claim 1, Petitioner states, “[t]he carbon nanotubes in the combination “have *an aspect ratio of*

*about 10 to about 10,000,” as taught by Lee.” (Petition, p.64). However, the ’909 Patent’s claimed aspect ratio is “10 to 500”. (’909 Patent, claim 1). The Petition provides no evidence or explanation of how or why a POSITA would reduce Lee’s upper limit by a factor of 20. What’s more, Petitioner’s summary of the prosecution history (Petition, pp. 3-4) also ignores and does not explain the Examiner’s express finding related to the claimed 10-500 aspect ratio range, “[r]egarding the aspect ratio, the prior art suggests that higher aspect ratios are preferred, thus teaching away from the claimed invention.” (LGES-1002, pp.55-56). The Petition does not explain how or why the claimed aspect ratio that is 20x lower than Lee would be made by a POSITA. This is a third independent reason that Ground 2A fails.*

**4. The suggested substitutions to modify the fundamental Lee teachings with Wepasnick lack proper rationale**

The Petition suggests that a POSITA would ignore the three fundamental properties of Lee described above and that Lee would somehow be combined with Wepasnick to yield independent claim 1 of the ’909 Patent. The Petitioner does not present proper rationale for its suggested hindsight combination.

Wepasnick, as Petitioner concedes, is merely “an academic study of the effect of various ‘commonly used wet chemical oxidants’ on ‘the surface chemistry and structure of MWCNTs.’” (Petition, p.41). Thus, while Wepasnick relates to oxidizing carbon nanotubes, it does not resolve the above-described two other fundamentally different teachings of the Lee primary reference, i.e., Lee 20x higher aspect ratio and

its “agglomerated” vs. “discrete” nanotubes. These are each additional independent reasons the Lee-Wepasnick combination fails. The combination would not yield claim 1, even if made. The failure of the combination is further confirmed by Petitioner’s deficient rationale in the Petition.

Petitioner’s first two purported reasons to combine and oxidize Lee’s unoxidized nanotubes is that “functional groups on the nanotubes would enhance this bonding [between nanotubes and non-carbonaceous material]” and “between nanotubes and the polymeric binder.” (Petition, pp. 44-45). However, Petitioner states at page 54 that “oxidation of nanotubes can help promote non-agglomeration of the nanotubes.” Thus, Petitioner’s primary reasons to combine (and for that matter all of Petitioner’s reasons) fundamentally alter Lee’s principle of operation to employ agglomerated nanotubes,<sup>2</sup> a rationale that is prohibited for an obviousness combination. The Federal Circuit has held that “combinations that change the ‘basic principles under which the [prior art] was designed to operate’ . . . may fail to support a conclusion of obviousness.” *Plas-Pak Indus., Inc. v. Sulzer Mixpac AG*, 600 F. App’x 755, 758 (Fed. Cir. 2015) (citing *In re Ratti*, F.2d 810, 813 (C.C.P.A 1959) (alterations in original)).

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<sup>2</sup> See, e.g., LGES-1006, abstract and 11 other references to “agglomerated” or “agglomerations of” nanotubes throughout Lee.

In support of Petitioner's third and fourth purported reason to combine Lee and Wepasnick, Petitioner rationalizes based on Wepasnick (LGES-1010) that "oxidative treatments can 'remove amorphous carbon and metallic impurities, thus leading to a higher-purity starting material.'" (Petition, p.45).<sup>3</sup> However, Lee does not suggest anywhere that amorphous carbon or metallic impurities are present in its unoxidized nanotubes and the Petition does not speculate that either.

Petitioner then says the proposed Wepasnick oxidation of Lee impacts "the structure of [the] MWCNTs." (*Id.*). Of course, altering the nanotube structures without explanation as the Petition suggests would be changing Lee's desired nanotube agglomeration and 20x higher aspect ratio, which are the antithesis of the claim requirements. Thus, the purported reasons to combine Lee and Wepasnick are without any foundation. What's more, the combination would be fundamentally changing Lee's principles of operation in regard to Lee's desired agglomeration and aspect ratio. Yet, Petitioner has not explained why a POSITA would do this and these reasons fail.

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<sup>3</sup> The same reference that Petitioner cites says, "[f]urthermore, the effect of different oxidizing conditions on CNT surface chemistry or structure is seldom considered." (LGES-1010, p.2).

Petitioner's fifth and final reason its suggests for trying to oxidize Lee's intentionally agglomerated nanotubes with an aspect ratio 20x that of claim 1 is the catch-all of applying known techniques to a known structure to yield predictable results. (Petition, p.46). Petitioner's conclusory reason does not explain any of the following:

- why change Lee's principle of operation requiring agglomerated nanotubes;
- why reduce Lee's aspect ratio by 20x; and
- why in the absence of hindsight modify Lee's anode material which already exhibits "improved cycle lifetime characteristics". (LGES-1006, paragraph [0010]).

Thus, lacking both explanation and evidence Petitioner's catch-all reason for Ground 2's combination is also deficient.

**5. The suggested Lee-Wepasnick combination even if made would lack discrete carbon nanotubes as claimed**

The Petition's reasoning that the agglomerated carbon nanotubes in the proposed Lee-Wepasnick combination are somehow "discrete" is difficult, if not, impossible to comprehend. The Petition starts by conceding Lee uses agglomerations:

The combination composition (based on Lee's anode active material; *see* [1pre]) includes "secondary particles that are formed by the **agglomeration** of primary nanoparticles 5." LGES-1006, [0040]. The primary nanoparticles in turn "include a non-carbonaceous material 1 and

*hollow carbon nanofibers 3.*” LGES-1006, [0040]. The hollow carbon nanofibers, red in FIG. 1, *infra*, are “*carbon nanotubes*,” *i.e.*, the combination anode active material (the composition) includes carbon nanotubes. *Id.*, [0046]; *see* [0020], [0084], Abstract, [0014], [0087], [0104]-[0105], claims 4 and 8; LGES-1003, ¶161.

(Petition, pp.52-53, emphasis added).

Without explaining, Petitioner then annotates Lee’s cartoon Figure 1 to say reference numeral 3 in Figure 1 which Lee calls “hollow carbon nanofibers” in the “agglomeration of primary nanoparticles 5” are somehow discrete “as generally individually distinct (e.g., non-agglomerated) nanotubes.” (Petition, p.53). Petitioner’s lack of explanation as to how a Lee “agglomeration” can be “non-agglomerated” is yet another reason Ground 2 fails.

Petitioner goes on to speculate about a couple other theories about why Lee may have discrete carbon nanotubes. (*Id.*, pp. 54-77). All of Petitioner’s speculation about Lee somehow having “discrete” carbon nanotubes are directly contrary to the teachings throughout Lee of “agglomerated” nanoparticles. (LGES-1006, abstract, paras. [0014], [0015], [0016], [0039], [0040], [0045], [0061], [0084], [0095], [0096], [0101]). Ignoring and speculating against the express teachings of Lee are insufficient to prove the “discrete” limitation and this is another reason Ground 2 fails.

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

Petitioner's Grounds all rely upon obviousness as noted above in Section II.D.

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 Section II.D.1 and II.D.2, the combination of Ohata-Kavan is deficient. The disclosures of the references are such that even if combined,

the combination fails to disclose the recited elements. Furthermore, Petitioner has failed to present sufficient rationale to support the proposed combinations of references (i.e., Ohata and Kavan). 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. Thus, a legal conclusion of obviousness cannot be supported here.

For example, as described above in Section II.D.1, Ohata discloses a fundamentally different composition than that recited the independent. Critically, Ohata lacks disclosure of at least three elements of independent claim 1: oxidized nanotubes; discrete nanotubes having crystals or layers of lithium ion active material attached (or ionically attached) to their surface; and the required lithium ion active material (whether in crystals or layers as claimed or otherwise).

Petitioner then relies upon Kavan as a secondary reference to combine with Ohata to cure these deficiencies and therefore allegedly render the claims obvious. However, the combination fails for at least the response given above in Section II.D.2. The combination fails because it lacks a proper rationale as MRD walks through in the sections above. Indeed, Kavan’s disclosure differs significantly from that of Ohata. For example, Ohata discloses aspect ratio and masterbatch process and Petitioner

makes no attempt to rationalize this with Kavan's shortened and aggregated nanotubes. Therefore, Petitioner's obviousness combinations fail for at least the reasons presented above. Petitioner has failed to present a *prima facie* case of obviousness since it has only presented conclusory statements, unsupported by the evidence instead of meeting its burden of "articulat[ing] 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).

Similar deficiencies exist with respect to the Lee-Wepasnick combination described above in Sections II.D.3-5. As with Ohata-Kavan, Petitioner has only presented conclusory statements that are unsupported by the evidence and therefore fails to present a *prima facie* case of obviousness. For example, as described above in Section II.D.3, Lee presents a fundamentally different agglomerated composition than that recited in Claim 1. Petitioner's attempts to modify Lee based on the combination with Wepasnick fail also since no proper rationale has been presented for the combination as described above in Section II.D.4.

Accordingly, the Petition fails to establish a reasonable likelihood that the claims are obvious over any of the asserted Grounds. Thus, the Board should decline to institute this IPR.

### III. THE BOARD SHOULD DENY INSTITUTION UNDER § 314(a)

As detailed below, the *Fintiv* factors favor denial.<sup>4</sup>

#### 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 will have expended significant resources, such as completing invalidity contentions and the technical document production, and thus, this factor would shift to favoring denial. (*See* MRD-2002).

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<sup>4</sup>As 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.

**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**

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.83). 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-2005, 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, three grounds out 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 Section II. The combinations of cited art presented in Petitioner’s Invalidity Grounds fail 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.

Further, it is telling that Petitioner's primary reference lacks at least three express claim elements. In a period from 2000-2010 alone, there were over 52,000 papers published and over 5,000 patents issued in the area of research and development of carbon nanotubes. (MRD-2004) ("Progress of carbon nanotube (CNT) research and development in terms of published papers and patents is reported . . . Publication growth of CNTs and related fields are analyzed for the period of 2000–2010. From the explored search term, "carbon nanotubes", the total number of papers containing the CNT concept is 52,224, and for patents is 5,746."). Given this vast array of potential prior art, since Petitioner was unable to find any primary reference more on point for the claimed elements than one missing three express elements, this shows the non-obviousness of the '909 Patent. Petitioner's cobbling together of disparate references and having an expert opine on such meeting each and every claim element (when in fact the references do not) is further weakened by this data on the breadth of information available in the carbon nanotube technology area.

Accordingly, this factor favors denying institution.

#### **IV. CONCLUSION**

For these reasons, MRD respectfully requests that the Board deny the Petition in full.

Dated: September 20, 2024

Respectfully Submitted,  
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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 9,412 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 20, 2024

Respectfully Submitted,  
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**CERTIFICATE OF SERVICE**

Pursuant to 37 C.F.R. § 42.6(e)(4), lead counsel for Patent Owner hereby certifies that on September 20, 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:

IPR18768-0210IP4@fr.com

PTABInbound@fr.com

Dated: September 20, 2024

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