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| EXAMINER | |
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| YOUNG, WILLIAM D | |

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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*Ex parte* SANG-YOUNG YOON,
ROCCO IOCCO, and JEONG JU CHO

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Appeal 2020-004082
Application 14/162,866
Technology Center 1700

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Before ADRIENE LEPIANE HANLON, DONNA M. PRAISS, and N. WHITNEY WILSON, *Administrative Patent Judges*.

HANLON, *Administrative Patent Judge*.

DECISION ON APPEAL

A. STATEMENT OF THE CASE

The Appellant[1] filed an appeal under 35 U.S.C. § 134(a) from an Examiner's decision finally rejecting claims 1–14, 16, 19, and 23–28. We have jurisdiction under 35 U.S.C. § 6(b).

We REVERSE.

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[1] We use the word "Appellant" to refer to "applicant" as defined in 37 C.F.R. § 1.42. The Appellant identifies the real party in interest as A123 Systems, LLC. Appeal Brief dated January 27, 2020 ("Appeal Br."), at 3.

The claims on appeal are directed to a positive electroactive material comprising (1) a nanoscale lithium transition metal phosphate material comprising an olivinic phase that includes lithium (Li), iron (Fe), manganese (Mn), one or more dopants (D), and phosphate ($PO_4$) and (2) a lithium metal oxide.

Representative claim 1 is reproduced below from the Claims Appendix to the Appeal Brief. The limitations at issue are italicized.

> 1. A positive electroactive material, comprising: a nanoscale lithium transition metal phosphate material comprising at least an olivinic phase that includes lithium (Li), iron (Fe), manganese (Mn), one or more dopants (D), and phosphate ($PO_4$), where an overall composition is $Li_aFe_{1-x-y}Mn_xD_y(PO_4)_z$, wherein $0.350 \leq x < 0.600$, $0 < y \leq 0.100$, $1.0 < a \leq 1.05$, and $1.0 < z \leq 1.025$ and D is selected from the group consisting of Co, Ni, V, Nb, and combinations thereof; and
>
> a lithium metal oxide,
>
> wherein the lithium metal oxide has a specific surface area of less than about 10 $m^2/g$,
>
> wherein the nanoscale lithium transition metal phosphate material has a conductivity of at least about $10^{-8}$ S/cm,
>
> wherein the nanoscale lithium transition metal phosphate material is optionally doped with Ti, Zr, Nb, Al, Ta, W, Mg, or F,
>
> wherein a weight ratio of the nanoscale lithium transition metal phosphate material to the lithium metal oxide is between 50:50 and 70:30, and
>
> *wherein the nanoscale lithium transition metal phosphate material is in the form of particulates, the particulates having a small size and a correspondingly high specific surface area; wherein*
>
> *the small size is about 75 nm or less, and*
>
> *the high specific surface area is greater than about 15 $m^2/g$.*

Appeal Br. 39.

Claim 23, the other independent claim on appeal, also recites a positive electroactive material comprising, *inter alia*, a nanoscale lithium transition metal phosphate material "in the form of particulates having a size of about 75 nm or less" and "hav[ing] a specific surface area greater than about 15 $m^2/g$ to form a high surface to volume ratio relative to the size of the particulates." Appeal Br. 44.

The Appellant discloses that a lithium iron manganese phosphate compound prepared with a "markedly smaller particle size and much larger specific surface area than previously known positive active materials" has improved transport properties. The Appellant discloses that "[i]mproved transport properties reduce impedance and may contribute to low impedance growth." Spec. ¶ 120. The Appellant also discloses that

> the small-particle-size, high specific-surface-area $LiFePO_4$-based material exhibits not only high thermal stability, low reactivity and high charge and discharge rate capability, but it also exhibits excellent retention of its lithium intercalation and deintercalation capacity during many hundreds, or even thousands, of high-rate cycles.

Spec. ¶ 121.

The Examiner maintains the following grounds of rejection on appeal:

(1) claims 1–8, 10–14, 16, and 19 under 35 U.S.C. § 103(a) as unpatentable over Barker et al.[2] in view of Takami et al.,[3] Xu,[4] and Miyasaka;[5]

(2) claim 9 under 35 U.S.C. § 103(a) as unpatentable over Barker in view of Takami, Xu, and Miyasaka, further in view of Beck et al.;[6]

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[2] US 7,771,628 B2, issued August 10, 2010 ("Barker").
[3] US 2010/0248038 A1, published September 30, 2010 ("Takami").
[4] US 8,470,207 B2, issued June 25, 2013 ("Xu").
[5] US 5,871,863, issued February 16, 1999 ("Miyasaka").
[6] US 9,178,215 B2, issued November 3, 2015 ("Beck").

(3) claims 23, 24, and 26–28 under 35 U.S.C. § 103(a) as unpatentable over Barker in view of Takami and Miyasaka; and

(4) claim 25 under 35 U.S.C. § 103(a) as unpatentable over Barker in view of Takami and Miyasaka, further in view of Beck.

B. DISCUSSION

The Examiner finds Barker discloses a positive electrode active material comprising a blend of lithium transition metal phosphate particles and lithium metal oxide particles. Final Act. 3.[7] The Examiner finds Barker does not disclose that the lithium transition metal phosphate particles have a size of about 75 nm or less and a specific surface area of greater than 15 $m^2/g$ as claimed. Final Act. 6.

The Examiner finds Miyasaka discloses positive electrode active material particles having a size of 0.03 µm (30 nm) to 50 µm and a specific surface area of 0.1–50 $m^2/g$. Final Act. 6 (citing Miyasaka, col. 7, ll. 30–43). The Examiner finds that a battery containing Miyasaka's positive electrode active material has a high voltage and a high discharge capacity. Final Act. 6 (citing Miyasaka, col. 1, ll. 65–67). The Examiner concludes that

> a person of ordinary skill in the art practicing the invention of Barker would have been motivated by design need to combine the particle size and specific surface area of Miyasaka with the lithium metal phosphate particles of Barker in order *to obtain electrode active material particles capable of producing high voltage and high discharge capacity in a battery*.

Final Act. 6–7 (emphasis added).

The Appellant argues that the Examiner's reason for combining Barker and Miyasaka is not supported by sufficient evidence in the record. Appeal Br. 16. The Appellant argues that

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[7] Final Office Action dated August 29, 2019.

> whether or not Miyasaka teaches wide ranges for the particle size and specific surface area of the *lithium metal oxides* disclosed therein, the Office has not established motivation in the evidence of record to apply such particle sizes and/or specific surface areas to a nanoscale *lithium transition metal phosphate material*, such as the cited lithium metal phosphate particles of Barker.

Appeal Br. 16 (emphasis added); *see also* Appeal Br. 25 (arguing that the Examiner has not established motivation in Miyasaka to apply the disclosed particle sizes and/or specific surface areas of *lithium metal oxides* to the *lithium metal phosphate particles* of Barker).

The Appellant also argues that there is no "evidence of a linkage between the particle size and specific surface area of Miyasaka and a voltage and/or discharge capacity of a battery." Appeal Br. 17. Although an object of Miyasaka's invention is to provide a battery having "'a high voltage and high discharge capacity,'" the Appellant argues that Miyasaka does not "attribute the high voltage and/or high discharge capacity to the particle size and specific surface area of particular compounds." Appeal Br. 17. Instead, the Appellant argues that Miyasaka attributes *high voltage* to a spinel crystal structure of lithium manganese oxide[8] and the inclusion of lithium cobalt oxide as a sub-active material[9] and links an *increase in discharge capacity* to the amount of lithium in the positive electrode active material.[10] Appeal Br. 17–18.

The Appellant's arguments are persuasive of reversible error. There appears to be no dispute on this record that Miyasaka discloses a lithium metal oxide rather than a lithium transition metal phosphate material as claimed. *See* Final Act. 16 (stating that "Miyasaka has not been relied upon for teaching lithium metal

[8] Miyasaka, col. 4, ll. 24–26.
[9] Miyasaka, col. 5, ll. 25–30.
[10] Miyasaka, col. 9, ll. 24–28.

phosphate active material"). The Examiner has failed to explain, in any detail, why the teachings of Miyasaka would have led one of ordinary skill in the art to modify the size and the specific surface area of Barker's lithium transition metal phosphate material rather than the size and specific surface area of Barker's lithium metal oxide. In that regard, claims 1 and 23 recite that "the *lithium metal oxide* has a specific surface area of less than about 10 $m^2/g$. Appeal Br. 39, 44 (emphasis added). The Examiner finds Takami discloses lithium metal oxide particles having a specific surface area within the range recited in claims 1 and 23. Final Act. 4, 11. It is unclear, on this record, why the teachings of Miyasaka are relevant to the claimed lithium transition metal phosphate material rather than cumulative of Takami's teachings with respect to the claimed lithium metal oxide. *See* Miyasaka, col. 7, ll. 41–43 (disclosing that a preferred specific surface area of the lithium metal oxide is 1 to 10 $m^2/g$).

Moreover, the Examiner has not directed us to any portion of Miyasaka disclosing that particle size and specific surface area affects the voltage and the discharge capacity of a battery. *See* Miyasaka, col. 4, ll. 24–26 (disclosing that *lithium manganese oxide* preferably has a spinel crystal structure, which gives a high voltage); Miyasaka, col. 5, ll. 25–30 (disclosing that *lithium cobalt oxide*, as a sub-active material, gives a high voltage); Miyasaka, col. 9, ll. 24–28 (disclosing that the amount of lithium in a positive electrode active material of the formula $Li_yMn_2O_4$ increases discharge capacity).

The Examiner finds that Miyasaka's electrode active material particles, having a size and a specific surface area within the ranges recited in claims 1 and 23, "*must be capable* of producing a high voltage and high discharge capacity in a battery" because Miyasaka teaches that *a battery* comprising the particles provides a high voltage and a high discharge capacity. Ans. 16 (emphasis added).[11]

To the extent the Examiner is relying on inherency to show that the size and the specific surface area of Miyasaka's positive electrode active material affect the voltage and the discharge capacity of the disclosed battery, the Examiner has not provided a sufficient factual basis to establish inherency. *See Hansgirg v. Kemmer*, 102 F.2d 212, 214 (CCPA 1939) (the mere fact that a certain thing may result from a given set of circumstances is not sufficient to show inherency).

Based on the foregoing, the Examiner has failed to establish that the teachings of Miyasaka would have led one of ordinary skill in the art to modify the particle size and the specific surface area of Barker's lithium transition metal phosphate material as recited in claims 1 and 23. The Examiner does not rely on the remaining prior art of record to cure the deficiencies in Miyasaka identified above. Therefore, the obviousness rejections on appeal are not sustained.

C. CONCLUSION

The Examiner's decision is reversed.

In summary:

[11] Examiner's Answer dated March 12, 2020.

| Claim(s) Rejected | 35 U.S.C. § | Reference(s)/Basis | Affirmed | Reversed |
|---|---|---|---|---|
| 1–8, 10–14, 16, 19 | 103(a) | Barker, Takami, Xu, Miyasaka | | 1–8, 10–14, 16, 19 |
| 9 | 103(a) | Barker, Takami, Xu, Miyasaka, Beck | | 9 |
| 23, 24, 26–28 | 103(a) | Barker, Takami, Miyasaka | | 23, 24, 26–28 |
| 25 | 103(a) | Barker, Takami, Miyasaka, Beck | | 25 |
| **Overall Outcome** | | | | 1–14, 16, 19, 23–28 |

REVERSED