

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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SAMSUNG ELECTRONICS CO., LTD. and  
SAMSUNG ELECTRONICS AMERICA, INC.,  
Petitioner,

v.

NANOCO TECHNOLOGIES LTD.,  
Patent Owner.

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IPR2021-00186  
Patent 8,524,365 B2

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Before ERICA A. FRANKLIN, GRACE KARAFFA OBERMANN, and  
CHRISTOPHER M. KAISER, *Administrative Patent Judges*.

OBERMANN, *Administrative Patent Judge*.

JUDGMENT  
Final Written Decision  
Determining No Challenged Claims Unpatentable  
*35 U.S.C. § 318(a)*

## I. INTRODUCTION

This is a Final Written Decision in an *inter partes* review of claims 1–23 of U.S. Patent No. 8,524,365 B2 (Ex. 1001, “the ’365 patent”). We have jurisdiction under 35 U.S.C. § 6 and enter this Decision pursuant to 35 U.S.C. § 318(a). For the reasons that follow, we determine that Petitioner<sup>1</sup> does not establish by a preponderance of the evidence that any challenged claim is unpatentable.

### *A. Procedural History*

Petitioner filed a Petition requesting review of the challenged claims. Paper 1 (“Pet.”). With the Petition, Petitioner filed the Declaration of Mark A. Green, Ph.D., in support of the challenges stated in the Petition. Ex. 1002. Patent Owner<sup>2</sup> filed a Preliminary Response to the Petition (Paper 12). Pursuant to our authorization, Petitioner filed a Reply (Paper 14) and Patent Owner filed a Sur-reply (Paper 15).

Based on that preliminary record, we instituted an *inter partes* review of all challenged claims based on all grounds of unpatentability asserted in the Petition. Paper 17 (“Dec.”). The following table sets forth the grounds.<sup>3</sup>

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<sup>1</sup> “Petitioner” refers collectively to Samsung Electronics Co., Ltd. and Samsung Electronics America, Inc. *See* Paper 38, 1 (identification of Petitioner’s real parties-in-interest).

<sup>2</sup> “Patent Owner” refers to Nanoco Technologies Ltd. Paper 6, 1. *See* Paper 6, 1 (identification of Patent Owner’s real party-in-interest).

<sup>3</sup> The Leahy-Smith America Invents Act (“AIA”), Pub. L. No. 112-29, 125 Stat. 284, 287–88 (2011), amended 35 U.S.C. §§ 102 and 103, effective March 16, 2013. Because the ’365 patent application has an effective filing date prior to March 16, 2013, the pre-AIA versions of §§ 102 and 103 apply.

Claims Challenged	35 U.S.C. §	References
1, 7–12, 17, 22, 23	102	Banin <sup>4</sup>
1, 7–12, 15–17, 22, 23	103(a)	Banin
2–6, 18–21	103(a)	Banin, Herron <sup>5</sup>
13, 14	103(a)	Banin, Treadway <sup>6</sup>
1–9, 17–23	103(a)	Zaban, <sup>7</sup> Farneth, <sup>8</sup> Yu <sup>9</sup>
1, 2, 4, 7–12, 17, 18, 22, 23	103(a)	Lucey, <sup>10</sup> Ahrenkiel <sup>11</sup>

<sup>4</sup> Banin et al., WO 03/097904 A1, published Nov. 27, 2003 (“Banin,” Ex. 1005).

<sup>5</sup> Herron et al., *Crystal Structure and Optical Properties of Cd<sub>32</sub>S<sub>14</sub>(SC<sub>6</sub>H<sub>5</sub>)<sub>36</sub>·DMF<sub>4</sub>, a Cluster with a 15 Angstrom CdS Core*, 259 SCIENCE 1426–1428 (1993) (“Herron,” Ex. 1016).

<sup>6</sup> Treadway et al., U.S. Patent No. 6,815,064, issued Nov. 9, 2004 (“Treadway,” Ex. 1015).

<sup>7</sup> Zaban et al., *Photosensitization of Nanoporous TiO<sub>2</sub> Electrodes with InP Quantum Dots*, 14 LANGMUIR 3153–3156 (1998) (“Zaban,” Ex. 1006).

<sup>8</sup> Farneth et al., *Bulk Semiconductors from Molecular Solids: A Mechanistic Investigation*, 4 CHEM. MATER. 916–922 (1992) (“Farneth,” Ex. 1009).

<sup>9</sup> Yu et al., *Heterogeneous Seeded Growth: A Potentially General Synthesis of Monodisperse Metallic Nanoparticles*, 123 J. AM. CHEM. SOC. 9198–9199 (2001) (“Yu,” Ex. 1010).

<sup>10</sup> Lucey et al., US 7,193,098 B1, issued Mar. 20, 2007 (“Lucey,” Ex. 1011).

<sup>11</sup> Ahrenkiel et al., *Synthesis and Characterization of Colloidal InP Quantum Rods*, 3 (6) NANO LETTERS 833–837 (2003) (“Ahrenkiel,” Ex. 1012).

Claims Challenged	35 U.S.C. §	References
13–16	103(a)	Lucey, Ahrenkiel, Treadway

After institution of trial, Patent Owner filed a Response (Paper 25,<sup>12</sup> “Resp.”), along with the Declaration of Brandi Cossairt, Ph.D. (Ex. 2030), Petitioner filed a Reply (Paper 32, “Reply”), along with the Second Declaration of Dr. Green (Ex. 1093), and Patent Owner filed a Sur-reply (Paper 39, “Sur-reply”).<sup>13</sup> The parties presented oral arguments during a hearing held by video on February 23, 2022.<sup>14</sup> Paper 46 (“Tr.”).

#### *B. Related Matters*

The parties identify litigation involving the ’365 patent as a related matter: *Nanoco Technologies Ltd. v. Samsung Electronics Co., Ltd.*, No. 2:20-cv-00038 (E.D. Tex.) (“District Court case”). Pet. 71; Paper 6, 1.

The parties also identify, as related matters, petitions for review filed in connection with four other patents asserted in the District Court case: IPR2021-00182 for U.S. Patent No. 9,680,068, IPR2021-00183 for U.S.

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<sup>12</sup> Patent Owner filed Paper 25 (unredacted Response) under seal and Paper 26 (redacted Response) in the public record. Thereafter, “the parties agreed that” the Response does “not contain confidential information and” does “not need to be sealed.” Paper 30, 1.

<sup>13</sup> Based on their respective statements of qualifications and curricula vitae, which are not contested, we determine that both Dr. Green and Dr. Cossairt are qualified to provide opinions about the knowledge and understanding of a person of ordinary skill in the art at the time of the invention. Ex. 1002 ¶¶ 17–30; Ex. 1003; Ex. 2030 ¶¶ 5–21, Appendix A.

<sup>14</sup> A consolidated hearing was conducted in IPR2021-00182, IPR2021-00183, IPR2021-00184, IPR2021-00185, and this proceeding, however, the cases are not consolidated. See Paper 43 (Order, setting oral argument).

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Patent No. 7,588,828 (“IPR183”), IPR2021-00184 for U.S. Patent No. 7,803,423, and IPR2021-00185 for U.S. Patent No. 7,867,557. Pet. 71; Paper 6, 1–2. Concurrently with this Decision, we enter final written decisions in those administrative proceedings.

*C. The '365 Patent (Ex. 1001)*

The '365 patent relates to “[a] nanoparticle comprising a molecular cluster compound and a core semiconductor material disposed on the molecular cluster compound.” Ex. 1001, 20:9–13. The semiconductor material, in turn, “comprises one or more elements not comprised within the molecular cluster compound.” *Id.* The nanoparticle may be prepared by a process that employs at least two precursor species in a nanoparticle precursor composition – “a first precursor species containing a first ion to be incorporated into the core semiconductor material and a separate second precursor species containing a second ion to be incorporated into the core semiconductor material.” *Id.* at 20:54–62.

The written description states, “There has been substantial interest in the preparation and characterization” of compound semiconductors that include “particles with dimensions in the order of 2–100 [nanometers] (nm).” *Id.* at 1:21–25. That interest “mainly” may be “due to their size-tunable electronic, optical, and chemical properties and the need for the further miniaturization of both optical and electronic devices.” *Id.* at 1:26–28. The written description further indicates that such nanoparticles may be useful in a “range” of “commercial applications,” including “biological labelling, solar cells, catalysts, biological imaging, [and] light-emitting diodes.” *Id.* at 1:29–31.

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