

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

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

v.

NANOCO TECHNOLOGIES LTD.,
Patent Owner.

IPR2021-00185
Patent 7,867,557 B2

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 1–6, 16, and 17 of U.S. Patent No. 7,867,557 B2 (Ex. 1001, “the ’557 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 Petitioner¹ 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 Owner² 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.³

¹ “Petitioner” refers collectively to Samsung Electronics Co., Ltd. and Samsung Electronics America, Inc. *See* Paper 39, 1 (identification of Petitioner’s real parties-in-interest).

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

³ The Leahy-Smith America Invents Act (“AIA”), Pub. L. No. 112-29, 125 Stat. 284, 287–88 (2011), amended 35 U.S.C. § 103, effective March 16, 2013. Because the ’557 patent application has an effective filing date prior to March 16, 2013, the pre-AIA version of § 103 applies.

Claims Challenged	35 U.S.C. §	References
1–6, 16, 17	103(a)	Banin, ⁴ Braun ⁵
1, 16, 17	103(a)	Zaban, ⁶ Ptatschek, ⁷ Braun
4–6	103(a)	Zaban, Ptatschek, Braun, Yu ⁸
1, 4, 16, 17	103(a)	Lucey, ⁹ Ahrenkiel, ¹⁰ Braun

After institution of trial, Patent Owner filed a Response (Paper 26,¹¹ “Resp.”), along with the Declaration of Brandi Cossairt, Ph.D. (Ex. 2030),

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

⁵ Braun et al., *Variation of the Thickness and Number of Wells in the CdS/HgS/CdS Quantum Dot Quantum Well System*, 105 J. PHYS. CHEM. A. 5548–5551 (2001) (“Braun,” Ex. 1013).

⁶ Zaban et al., *Photosensitization of Nanoporous TiO₂ Electrodes with InP Quantum Dots*, 14 LANGMUIR 3153–3156 (1998) (“Zaban,” Ex. 1006).

⁷ Ptatschek et al., *Quantized Aggregation Phenomena in II-VI Semiconductor Colloids*, 102 PHYS. CHEM. 85–95 (1998) (“Ptatschek,” Ex. 1008).

⁸ 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).

⁹ Lucey et al., US 7,193,098 B1, issued Mar. 20, 2007 (“Lucey,” Ex. 1011).

¹⁰ Ahrenkiel et al., *Synthesis and Characterization of Colloidal InP Quantum Rods*, 3 (6) NANO LETTERS 833–837 (2003) (“Ahrenkiel,” Ex. 1012).

¹¹ Patent Owner filed Paper 26 (unredacted Response) under seal and Paper 27 (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 31, 1.

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Petitioner filed a Reply (Paper 33, “Reply”), along with the Second Declaration of Dr. Green (Ex. 1093), and Patent Owner filed a Sur-reply (Paper 40, “Sur-reply”).¹² The parties presented oral arguments during a hearing held by video on February 23, 2022.¹³ Paper 47 (“Tr.”).

B. Related Matters

The parties identify litigation involving the ’557 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. 68; 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. Patent No. 7,588,828 (“IPR183”), IPR2021-00184 for U.S. Patent No. 7,803,423 (“IPR184”), and IPR2021-00186 for U.S. Patent No. 8,524,365. Pet. 68; Paper 6, 1–2. Concurrently with this Decision, we enter final written decisions in those administrative proceedings.

C. The ’557 Patent (Ex. 1001)

The ’557 patent relates to a method for producing nanoparticles having a core, a first layer, and a second layer. Ex. 1001, 3:24–29. Each comprises a semiconductor material, but the core material differs from that

¹² 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.

¹³ A consolidated hearing was conducted in IPR2021-00182, IPR2021-00183, IPR2021-00184, this proceeding, and IPR2021-00186, however, the cases are not consolidated. *See* Paper 44 (Order, setting oral argument).

of the first layer, and the first layer material differs from that of the second layer. *Id.* at 3:29–32, 30:65–31:17.

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), often referred to as quantum dots and nanocrystals.” *Id.* at 1:16–19. 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 1:21–23. 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 1:24–27.

The claimed method includes a step of “effecting conversion of a nanoparticle core precursor composition to the material of the nanoparticle core, depositing said first layer on said core and depositing said second layer on said first layer.” *Id.* at 3:33–36; *see id.* at 30:65–31:17 (claim 1). The “core precursor composition,” in turn, includes “a first precursor species containing a first ion to be incorporated into the growing nanoparticle core.” *Id.* at 3:35–38. The core precursor composition also includes “a separate second precursor species containing a second ion to be incorporated into the growing nanoparticle core.” *Id.* at 3:38–40. The “conversion” is “effected in the presence of a molecular cluster compound” (“MCC”) “under conditions permitting seeding and growth of the nanoparticle core.” *Id.* at 3:40–43.

The written description provides examples for preparing a nanoparticle core (*id.* at 15:60–17:57), a first layer (*id.* at 21:27–22:33), and a second layer (*id.* at 22:35–40). That description also provides examples for

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