

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*.

DECISION
Granting Institution of *Inter Partes* Review
35 U.S.C. § 314

I. INTRODUCTION

Samsung Electronics Co., Ltd. and Samsung Electronics America, Inc. (collectively, “Petitioner”) filed a Petition requesting 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”). Paper 1 (“Petition” or “Pet.”). Nanoco Technologies Ltd. (“Patent Owner”) filed a Preliminary Response to the Petition. Paper 12 (“Prelim. Resp.”). With our authorization, Petitioner filed a Reply (Paper 14, “Pet. Reply”), and Patent Owner filed a Sur-reply (Paper 15, “Sur-reply”). For purposes of this Decision, we accept the parties’ contentions regarding real parties in interest.

We have authority to determine whether to institute an *inter partes* review. *See* 35 U.S.C. § 314 (2018); 37 C.F.R. § 42.4(a) (2020). The standard for instituting an *inter partes* review is set forth in 35 U.S.C. § 314(a), which provides that an *inter partes* review may not be instituted unless “there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition.” For reasons explained below, we determine that Petitioner shows a reasonable likelihood of prevailing with respect to at least one challenged claim. Accordingly, we institute *inter partes* review of all challenged claims based on all grounds asserted in the Petition. *See SAS Inst. Inc. v. Iancu*, 138 S. Ct. 1348, 1354, 1359–60 (2018); Patent Trial and Appeal Board Consolidated Trial Practice Guide (Nov. 2019)¹ (“The Board will not institute on fewer than all claims or all challenges in a petition.”).

¹ Available at <https://www.uspto.gov/TrialPracticeGuideConsolidated>.

At this preliminary stage of the proceeding, we have not made a final determination as to the patentability of any challenged claim or any factual or legal issue underlying the patentability inquiry. Any final determination shall be based on the full trial record. Any argument not raised by Patent Owner in a timely filed response to the Petition, or as permitted in another manner during trial, shall be deemed waived, even if it was presented in the Preliminary Response. Nothing in this Decision represents an invitation for Petitioner to supplement the information presented in the Petition.

A. 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, IPR2021-00184 for U.S. Patent No. 7,803,423, and IPR2021-00186 for U.S. Patent No. 8,524,365. Pet. 68; Paper 6, 1–2.

B. 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 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 Specification 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 Specification 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 a conversion of a nanoparticle core precursor composition to the material of the nanoparticle core, depositing said first layer on the 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 under conditions permitting seeding and growth of the nanoparticle core.” *Id.* at 3:40–43.

The Specification 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). The Specification also provides examples for preparing molecular cluster compounds. *Id.* at 26:27–47. The Specification describes a preferred “three-step process” whereby “cores are synthesized and isolated from a growth solution,” then a first layer “is grown onto the cores in a separate reaction and isolated once again.” *Id.* at 23:45–51. An outer layer “is grown onto the core-shell structure,” thereby producing, for example, a

“quantum dot-quantum well.” *Id.* at 23:51–53. The Specification describes experimental conditions for producing an exemplary nanoparticle represented by the formula $ZnS/CdSe/Cd_xZn_{1-x}S$. *Id.* at 26:11–30:22.

C. Challenged Claims

We reproduce below claim 1, which is the sole independent challenged claim and illustrates the subject matter of the invention.

1. A method for producing a nanoparticle comprised of a core comprising a core semiconductor material, a first layer comprising a first semiconductor material provided on said core and a second layer comprising a second semiconductor material provided on said first layer, said core semiconductor material being different to said first semiconductor material and said first semiconductor material being different to said second semiconductor material, the method comprising:

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, said core precursor composition comprising a first precursor species containing a first ion to be incorporated into the growing nanoparticle core and a separate second precursor species containing a second ion to be incorporated into the growing nanoparticle core,

said conversion being effected in the presence of a molecular cluster compound different from the nanoparticle core precursor composition.

Ex. 1001, 30:65–31:17.

D. Asserted Grounds of Unpatentability

Petitioner asserts the following grounds of unpatentability:

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