

**IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF DELAWARE**

NNCRYSTAL US CORPORATION AND
THE BOARD OF TRUSTEES OF THE
UNIVERSITY OF ARKANSAS

Plaintiffs,

V.

NANOSYS, INC.

Defendant.

C.A. No. 19-1307-RGA

JURY TRIAL DEMANDED

FIRST AMENDED COMPLAINT FOR PATENT INFRINGEMENT

Plaintiffs NNCrystal US Corporation (“NNCrystal”) and The Board of Trustees of the University of Arkansas (“University of Arkansas”) (collectively, “Plaintiffs”) hereby allege the following claim for patent infringement against defendant Nanosys, Inc. (“Nanosys” or “Defendant”).

NATURE OF THE ACTION

1. This is an action for patent infringement arising under the patent laws of the United States, Title 35, United States Code, against defendant Nanosys for infringement of U.S. Patent No. 7,105,051 (“’051 patent”).

2. The '051 patent relates to, among other things, semiconductor nanocrystals having high photoluminescence quantum yields and methods for preparing the same. Such nanocrystals, often referred to as “quantum dots,” exhibit size-dependent photoluminescence. For example, differently sized quantum dots comprised of cadmium selenide (CdSe) or indium phosphide (InP) emit colors from blue to red with comparatively pure color emissions. As a

result, such nanocrystals may be used, for example, in high-quality flat panel displays, including high-definition televisions and tablets.

3. On information and belief, and as discussed in greater detail below, Nanosys infringes one or more claim of the '051 patent, including at least claim 1 and/or claim 22, at least by performing and/or directing others to perform the processes claimed in the '051 patent to manufacture products, including but not limited to products marketed as Quantum Dot Concentrate™, Heavy Metal Free Quantum Dots, Hyperion® Quantum Dots, and Quantum Dots (“Nanosys Quantum Dot Products”).

PARTIES

4. Plaintiff NNCrystal specializes in developing top-quality nanomaterials, including colloidal nanocrystals, using the well-known, greener processes claimed in the '051 patent. NNCrystal's products offer superior performance, higher quality, and versatility for demanding research applications. NNCrystal is incorporated in Arkansas and located at the Arkansas Research & Technology Part, 534 W. Research Center Blvd., Ste. 254, Fayetteville, AR 72701.

5. Plaintiff University of Arkansas is one of the nation's top public research universities and is located at 1 University of Arkansas, Fayetteville, AR 72701.

6. On information and belief, Defendant Nanosys is incorporated in Delaware and has its principal place of business at 233 S Hillview Dr, Milpitas, CA 95035. On information and belief, Nanosys manufactures one or more of the Nanosys Quantum Dot Products at its California facility using the process claimed in the '051 patent.

JURISDICTION AND VENUE

7. This action arises under the patent laws of the United States, 35 U.S.C. §§ 100, *et seq.*, and this Court has jurisdiction over the subject matter of this action under 28 U.S.C. §§ 1331 and 1338(a).

8. This Court has personal jurisdiction over Nanosys because it is incorporated in Delaware.

9. Venue is proper in this Court under 28 U.S.C. § 1400(b) because defendant Nanosys, as a corporation existing under the laws of Delaware, resides in this judicial district.

PATENT-IN-SUIT

10. On September 12, 2006, the U.S. Patent and Trademark Office duly and legally issued the '051 patent, entitled "High Quality Colloidal Nanocrystals and Methods of Preparing the Same in Non-Coordinating Solvents." A true and correct copy of the '051 patent is attached hereto as Exhibit A. The claims of the '051 patent are valid and enforceable.

11. University of Arkansas is the owner and assignee of the '051 patent.

12. NNCrystal has an exclusive license to the '051 patent and the right to sue for infringement of the '051 patent.

13. The '051 patent claims processes for preparing colloidal nanocrystals using non-coordinating solvents. The '051 patent states that prior processes for preparing high quality semiconductor nanocrystals exclusively used coordinating solvents based on the general belief that coordinating solvents were required to adequately dissolve and allow complete reaction of their synthetic precursors. The '051 patent explains that coordinating solvents have several limitations, including difficulties in identifying appropriate coordinating solvents for particular

systems, high cost, and high levels of toxicity, which effectively precluded large scale production.

14. The '051 patent further explains that prior attempts to improve processes for preparing high-quality nanocrystals relied on a mixture of coordinating reagents as the solvent. As stated in the '051 patent, such approaches were limited by difficulties in determining the role of each component of the coordinating solvent in the growth of nanocrystals, the inability to recycle raw materials, and the toxicity of the most popular coordinating solvents such as organophosphorous compounds.

15. As noted in the '051 patent, the cost and toxicity associated with prior methods for preparing colloidal nanocrystals may have hindered or precluded large-scale production.

16. The '051 patent states that prior to the development of the technology described therein, the lack of adequate methods for producing high-quality nanocrystals hampered the development of nanocrystal-based emitters. As stated in the '051 patent, prior methods at times provided irreproducible results, low-quality crystals, high polydispersity, and/or unacceptable levels of impurities.

17. The technology described and claimed in the '051 patent overcame the limitations of prior processes and established for the first time that—contrary to the popular wisdom regarding the required use of coordinating solvents—non-coordinating solvents could be used to produce high-quality, small, highly monodisperse nanocrystals, with the added benefits of a safer, more environmentally friendly, and less costly process that afforded tunable crystal size, shape, and size/shape distribution and allows for recycling and reuse of the solvent.

18. As an example of the cost-savings made possible by the '051 patent, the '051 patent states that cost of a typical non-coordinating solvent used in the invention, such as

octadecene (ODE), is about 10–100 times less expensive than the most commonly used coordinating solvent, trioctylphosphine oxide (“TOPO”). The current price of technical grade ODE from a popular vendor is about ten times less than the price of technical grade TOPO. *See* <https://www.sigmaaldrich.com/catalog/product/aldrich/o806?lang=en®ion=US> (technical grade ODE costs \$37.40 per liter, which is about \$0.047 per gram at a density of 0.789 g/ml); <https://www.sigmaaldrich.com/catalog/product/aldrich/346187?lang=en®ion=US> (technical grade ODE costs \$232.00 for 500 grams, e.g., about \$0.46 per gram).

19. Exemplary claim 1 of the ’051 patent recites: “A method of synthesizing colloidal nanocrystals, comprising: a) combining a cation precursor, a ligand, and a non-coordinating solvent to form a cation-ligand complex; and b) admixing an anion precursor with the cation-ligand complex at a temperature sufficient to form nanocrystals.”

INFRINGEMENT BY NANOSYS

20. Plaintiffs repeat and reallege each of the allegations contained in the paragraphs above.

21. On information and belief, Nanosys makes, uses, sells, and/or offers to sell in the United States the Nanosys Quantum Dot Products.

22. According to its website (<https://www.nanosysinc.com/who-we-are>), Nanosys produces the world’s “lowest cost” quantum dot materials.

23. According to its website (<https://www.nanosysinc.com/news/2015/5/29/nanosys-first-to-achieve-epa-approval-for-mass-production-of-quantum-dots>), Nanosys obtained approval from the U.S. Environmental Protection Agency (“EPA”) for large-scale production of these low-cost quantum dots and has the capacity to produce over 25 tons of cadmium-free or cadmium-based quantum dot materials per year.

24. On information and belief, in connection with the manufacturing of the Nanosys Quantum Dot Products, Nanosys performs processes to prepare colloidal nanocrystals comprising (a) a cation precursor, a ligand and a non-coordinating solvent to form a cation-ligand complex; and (b) admixing an anion precursor with the cation-ligand complex at a temperature sufficient to form nanocrystals, as recited in claim 1 of the '051 patent.

25. On information and belief, in connection with the manufacturing of the Nanosys Quantum Dot Products, Nanosys performs processes to prepare colloidal nanocrystals comprising cation precursors, e.g., precursors to cadmium (II), indium (III), and zinc (II), with a ligand in a non-coordinating solvent such as ODE to form a cation-ligand complex, as recited in claim 1 of the '051 patent.

26. On information and belief, in connection with the manufacturing of the Nanosys Quantum Dot Products, Nanosys performs processes to prepare colloidal nanocrystals comprising admixing cation-ligand complexes with anion precursors, e.g., precursors to selenides, phosphides, and sulfides, at a temperature sufficient to form nanocrystals, as recited in claim 1 of the '051 patent.

27. On information and belief, one or more of the Nanosys Quantum Dot Products are made using a process that literally or equivalently meets every limitation of at least claim 1 and/or claim 22 of the '051 patent.

COUNT I (INFRINGEMENT OF THE '051 PATENT)

28. Plaintiffs repeat and reallege each of the allegations contained in the paragraphs above.

29. Nanosys has infringed, and will continue to infringe, one or more claims of the '051 patent, including at least claim 1 and/or claim 22 of the '051 patent, by performing and/or

inducing others to perform processes to prepare colloidal nanocrystals comprising (a) a cation precursor, a ligand and a non-coordinating solvent to form a cation-ligand complex; and (b) admixing an anion precursor with the cation-ligand complex at a temperature sufficient to form nanocrystals, in violation of 35 U.S.C. §§ 271(a), (b), and/or (c).

30. On information and belief, Nanosys's infringement has been and continues to be willful since at least the filing of the Original Complaint on July 12, 2019.

31. Plaintiffs have been injured by Nanosys's infringement of the '051 patent and will suffer irreparable harm unless Nanosys is enjoined from infringing the '051 patent.

32. Plaintiffs demand trial by jury for all issues relating to this claim.

PRAYER FOR RELIEF

WHEREFORE, Plaintiffs respectfully request this Court to:

A. Enter judgment in favor of Plaintiffs that Nanosys has infringed one or more claims of the '051 patent;

B. Enter judgment in favor of Plaintiffs that Nanosys has willfully infringed one or more claims of the '051 patent at least since the filing of the Original Complaint on July 12, 2019;

C. Issue a permanent injunction enjoining Nanosys (including its officers, directors, employees, agents, and all persons acting in concert with them) from infringing the '051 patent;

D. Order Nanosys to pay compensatory damages to Plaintiffs for Nanosys's infringement of the '051 patent, including but not limited to, damages for lost profits and in no event less than a reasonable royalty, together with interest and costs under 35 U.S.C. § 284;

E. Find this to be an exceptional case, award Plaintiffs treble damages due to Nanosys's deliberate and willful conduct at least from the date of the Original Complaint, and order Nanosys to pay Plaintiffs' costs and fees;

F. Award Plaintiffs pre-judgment interest; and

G. Award other relief as the Court deems appropriate, including appropriate relief under 35 U.S.C. § 285.

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