UNITED STATES DISTRICT COURT
MIDDLE DISTRICT OF FLORIDA
ORLANDO DIVISION

SAINT-GOBAIN CRISTAUX ET DETECTEURS, a French corporation, and SAINT-GOBAIN CERAMICS AND PLASTICS, INC., a Delaware corporation,	)	
Plaintiffs,	)	Case No. _____
v.	)	
CRYSTAL PHOTONICS, INC.,	)	
Defendant.	)	

COMPLAINT AND DEMAND FOR TRIAL BY JURY

1. Plaintiffs Saint-Gobain Cristaux et Detecteurs and Saint-Gobain Ceramics and Plastics, Inc. (collectively "Saint-Gobain Crystals" or "Plaintiffs") claim as follows against Defendant Crystal Photonics, Inc. ("CPI" or "Defendant").

THE PARTIES

2. For more than 80 years, Saint-Gobain Crystals has offered diverse, high quality crystalline materials for use in medical technologies, security applications, and revolutionary research and development projects. Saint-Gobain Crystals' high-performance, high-reliability products include synthetic sapphire transparent armor, precision scintillator crystals, X-ray monochromator crystals, and epitaxy substrates made of garnet. Since 1996, Saint-Gobain Crystals has produced scintillation detectors and materials for a wide variety of applications, including cutting-edge medical applications and for space missions such as the

2001 Mars Odyssey, the 2011 Curiosity Mars Rover, and the 2015 CALET Calorimetric Electron Telescope.

3. Plaintiff Saint-Gobain Cristaux et Detecteurs ("SGCD") is a French corporation with its principal offices located at 104 Route de Larchant, 77140 Saint Pierre Les Nemours, France.

4. Plaintiff Saint-Gobain Ceramics and Plastics, Inc. ("SGCP") is a Delaware corporation with its principal offices located at 20 Moores Road, Malvern PA, 19355, US.

5. On information and belief, Defendant Crystal Photonics, Inc. ("CPI") is a Florida corporation with its principal offices located at 5525 Benchmark Lane, Sanford, Florida 32773.

JURISDICTION AND VENUE

6. This is an action for patent infringement under the United States Patent Laws, 35 U.S.C. § 271, *et seq*. This Court has subject matter jurisdiction over this action under 28 U.S.C. §§ 1331 and 1338.

7. This Court has personal jurisdiction over CPI because CPI is incorporated in the State of Florida and therefore may be fairly regarded as at home in this judicial district.

8. Venue is proper in this Court pursuant to 28 U.S.C. § 1400(b). CPI is incorporated in the State of Florida and has its principal place of business in this judicial district. Therefore, CPI resides in this judicial district according to 28 U.S.C. § 1400(b).

THE PATENTS-IN-SUIT

9. Plaintiff SGCD is the owner by assignment of all right, title, and interest in and to United States Patent No. 7,651,632 ("the '632 Patent") entitled "Low-Delayed Luminescence Dense and Rapid Scintillator Material," which duly and legally issued in the names of Bernard Ferrand, Bruno Viana, Ludivine Pidol, and Pieter Dorenbos on January 26, 2010. A true and correct copy of the '632 Patent is attached hereto as Exhibit A.

10. Plaintiff SGCD is the owner of all right, title, and interest in and to United States Patent No. 8,034,258 ("the '258 Patent") entitled "Dense High-Speed Scintillator Material of Low Afterglow," which duly and legally issued in the names of Bernard Ferrand, Bruno Viana, Ludivine Pidol, and Pieter Dorenbos on October 11, 2011. A true and correct copy of the '258 Patent is attached hereto as Exhibit B.

11. The '632 Patent and the '258 Patent (collectively, "the Asserted Patents") are valid and enforceable.

12. SGCP has an exclusive license to sell LYSO crystals that practice the Asserted Patents in the United States.

13. On information and belief, CPI has infringed and continues to infringe one or more claims of each of the Asserted Patents by engaging in acts that constitute infringement under 35 U.S.C. § 271, including but not necessarily limited to making, using, selling, and/or offering for sale, in this district and elsewhere in the United States certain LYSO scintillator crystals.

FACTUAL BACKGROUND

A. Saint-Gobain's LYSO Scintillator Technology

14. Saint-Gobain Crystals offers an industry-leading variety of scintillator crystal materials for radiation detection and nuclear identification. A scintillator works by absorbing particle energy (such as the energy in a gamma ray or another source of ionizing radiation) and converting it into visible light that can be detected and measured to characterize the radiation. A scintillator material is a transparent material, sometimes a single crystal, which is incorporated in detectors used in the fields of nuclear medicine, physics, chemistry and oil exploration to detect radiation. Specifically, inorganic scintillator materials are incorporated into CT (computed tomography) scanners, PET (Positron Emission Tomography) scanners, and time-of-flight PET scanners used in imaging biological tissue. Since CT, PET, and time-of-flight scanners employ ionizing radiation, scintillators are necessary to convert radiation into a visible form in order to analyze biological tissue samples.

15. One family of scintillator crystals is Lutetium-yttrium oxyorthosilicate or LYSO (Lu Y SiO_5: Ce), a cerium-doped, lutetium-based scintillator crystal. Lu (lutetium) and Y (yttrium) are categorized as trivalent rare earth metals. Trivalent metals form inorganic compounds in the +3 oxidation state. Doping is the intentional introduction of a small amount of a chemical element into a material to alter the properties of the material.

16. LYSO crystals are dense, bright, and create visible light in a short pulse. The high density and high atomic number of LYSO crystals increases the probability of gamma ray interaction, and therefore renders LYSO crystals highly efficient at stopping gamma rays. LYSO crystals' high brightness means more visible light is produced per amount of energy absorbed, which results in a greater signal and a reduction in statistical uncertainty in position and energy. Creation of visible light in a short pulse enables faster data acquisition. These qualities make LYSO crystals ideal for PET applications that require higher throughput, better timing, and higher resolution.

17. A desirable property of a scintillator crystal is the ability to reduce the amount of light emitted after incident radiation stops, known as afterglow. Afterglow is caused by the presence of electron traps in the crystallographic structure. Electrons may become detrapped, or released, by thermal excitation (including at room temperature) resulting in a photo emission, or afterglow, which can sometimes be measured even a full second after the incident radiation stops. Afterglow is undesirable in many applications, because it results in poorer resolution.

18. In order to address the afterglow issue in LYSO crystals, SGCD partially funded a collaboration with Delft University of Technology and École Nationale Supérieure de Chimie de Paris ("Chimie Paris Tech" or "ENSCP"). The inventors of the Asserted Patents worked on this team, and under agreements

governing the collaboration, all rights in the Asserted Patents were assigned to SGCD.

19. The inventors of the Asserted Patents discovered that the addition of a divalent alkaline earth metal and/or a trivalent metal to a LYSO-type crystal substantially reduces afterglow. The divalent alkaline earth metal can be (but is not limited to) calcium (Ca), magnesium (Mg), strontium (Sr) (in divalent cation form), and may substitute for Y or Lu. The trivalent metal can be (but is not limited to) aluminum (Al), gallium (Ga), or indium (In) (in trivalent cation form), and may substitute for silicon (Si).

20. Plaintiffs produce and sell scintillator crystals, including LYSO crystals, with reduced afterglow through their practice of the Asserted Patents. For example, Plaintiffs' LYSO crystals containing calcium have demonstrated a significant reduction in afterglow following X-ray excitation. *See* "Evidence and Consequences of Ce^{4+} in LYSO: Ce,Ca, and LYSO: Ce,Mg Single Crystals for Medical Imaging Applications," IEEE TRANSACTIONS ON NUCLEAR SCIENCE, VOL. 60, No. 4 (August 2013) (analyzing the afterglow reduction in Saint-Gobain Crystals' LYSO doped crystals).

B. CPI's Accused Products

21. On information and belief, CPI's founder and president, Bruce H. T. Chai, began manufacturing LYSO crystals in the United States in 1999. On information and belief, CPI sells its LYSO crystals to third parties to incorporate into scintillation detectors and scanners, including PET scanners.

22. On information and belief, CPI makes, uses, offers to sell, and/or sells doped LYSO crystals that practice Plaintiffs' patented technology. Specifically, according to an analysis performed by Plaintiffs on a sample CPI crystal obtained by Plaintiffs, CPI's crystals contain Lu, Y, Si, O, Ce, a divalent alkaline earth metal, and/or a trivalent metal in proportions disclosed in the Asserted Patents.

COUNT I
(Infringement of the '632 Patent)

23. Plaintiffs reallege and incorporate by reference the allegations contained in paragraphs 6-8, 9, 11-13, and 19-22 above as if fully set forth herein.

24. CPI has directly infringed, and continues to infringe, literally or under the doctrine of equivalents, at least claim 1 of the '632 patent, by making, using, offering to sell, and/or selling CPI crystals in the United States, without authority or license, in violation of 35 U.S.C. § 271.

25. For example, CPI's crystals meet each limitation of claim 1 of the '632 patent, which recites:

> An inorganic scintillator material of formula $Lu_{(2-y)}Y_{(y-z-x)}Ce_xM_zSi_{(1-v)}M'_vO_5$, in which:
>
> > M represents a divalent alkaline earth metal ion and M′ represents a trivalent metal,
> >
> > (z+V) being greater than or equal to 0.0001 and less than or equal to 0.2;
> >
> > z being greater than or equal to 0 and less than or equal to 0.2;
> >
> > v being greater than or equal to 0 and less than or equal to 0.2;
> >
> > x being greater than or equal to 0.0001 and less than 0.1; and
> >
> > y ranging from (x+z) to 1.

26. In the formula, Lu is lutetium, Y is yttrium, Ce is cerium, Si is silicon, and O is oxygen.

27. Upon information and belief, CPI's crystals contain each recited element in the disclosed relative proportions. CPI's crystals are an inorganic scintillator material. Testing conducted for Plaintiffs on a CPI crystal showed that the CPI crystal included Lu, Y, Ce, and SiO_5. Based on this testing, the formula unit variables for the CPI crystal are x = 0.00188, y = 0.21006, z = 0.0003, and v = 0. The M component in CPI's crystal is calcium, which is a divalent alkaline earth metal. These formula unit variables are within the ranges claimed in claim 1, as shown below:

	'632 Patent, Claim 1	**CPI Sample**
M	Divalent Alkaline Earth Metal	Ca
x	$0.0001 \leq x \leq 0.1$	0.00188
z	$0 \leq z \leq 0.2$	0.00030
v	$0 \leq v \leq 0.2$	0.00003
x+z	--	0.00218
y	$(x+z) \leq y \leq 1$	0.21006

28. As a direct and proximate consequence of CPI's infringement of the '632 Patent, Plaintiffs have suffered significant damages in an amount not yet determined for which Plaintiffs are entitled to relief.

COUNT II
(Infringement of the '258 Patent)

29. Plaintiffs reallege and incorporate by reference the allegations contained in paragraphs 6-8, 10-13, and 19-22 above as if fully set forth herein.

30. CPI has directly infringed, and continues to infringe, literally or under the doctrine of equivalents, at least claims 5, 15, and 17 of the '258 patent, by making, using, offering to sell, and/or selling CPI crystals in the United States, without authority or license, in violation of 35 U.S.C. § 271.

31. For example, CPI's crystals meet each limitation of claim 5 of the '258 patent, which recites:

> An inorganic LYSO-type scintillator material comprising Lu, Si, O, Y and M or M' in which M represents a divalent alkaline earth metal ion and M' represents a trivalent metal wherein M or M reduces an afterglow.

32. In the claim, Lu is lutetium, Y is yttrium, Si is silicon, and O is oxygen.

33. Testing conducted for Plaintiffs on a CPI crystal showed that the CPI crystal included Lu, Y, Si, O, and calcium, which is a divalent alkaline earth metal.

34. Upon information and belief, doping these LYSO crystals with calcium reduces afterglow. *See* "Evidence and Consequences of Ce^{4+} in LYSO: Ce,Ca, and LYSO: Ce,Mg Single Crystals for Medical Imaging Applications," IEEE TRANSACTIONS ON NUCLEAR SCIENCE, VOL. 60, No. 4 (August 2013).

35. Further, CPI's crystals meet each limitation of claim 15 of the '258 patent, which recites:

> An inorganic LYSO-type scintillator material comprising a trivalent rare earth ion, Si, O, Y and M or M' in which M represents a divalent alkaline earth metal ion and M' represents a trivalent metal wherein M or M' reduces an afterglow.

36. In the claim, Y is yttrium, Si is silicon, and O is oxygen.

37. Testing conducted for Plaintiffs on a CPI crystal showed that the CPI crystal included lutetium (Lu), which is a trivalent rare earth ion, Y, Si, O, and calcium, which is a divalent alkaline earth metal.

38. Upon information and belief, CPI's LYSO crystals with calcium reduce afterglow. *See* "Evidence and Consequences of Ce^{4+} in LYSO: Ce,Ca, and LYSO: Ce,Mg Single Crystals for Medical Imaging Applications," IEEE TRANSACTIONS ON NUCLEAR SCIENCE, VOL. 60, No. 4 (August 2013).

39. In addition, CPI practices the method of claim 17 of the '258 patent, which recites:

> A method for reducing the afterglow of an inorganic LYSO-type scintillator material comprising Lu, Si, O wherein a divalent alkaline earth metal ion M, or a trivalent metal M' selected from the group consisting of Al, Ga, and In is added to said material.

40. In the claim, Lu is lutetium, Y is yttrium, Si is silicon, and O is oxygen.

41. Testing conducted for Plaintiffs on a CPI crystal showed that the CPI crystal included Lu, Y, Si, O, and calcium, which is a divalent alkaline earth metal.

42. Upon information and belief, CPI practices the patented method by doping these LYSO crystals with calcium, which reduces afterglow. *See* "Evidence and Consequences of Ce^{4+} in LYSO: Ce,Ca, and LYSO: Ce,Mg Single Crystals for Medical Imaging Applications," IEEE TRANSACTIONS ON NUCLEAR SCIENCE, VOL. 60, No. 4 (August 2013).

43. As a direct and proximate consequence of CPI's infringement of the '258 Patent, Plaintiffs have suffered significant damages in an amount not yet determined for which Plaintiffs are entitled to relief.

PRAYER FOR RELIEF

Wherefore, Plaintiffs respectfully request entry of judgment in its favor and against CPI as follows:

1. A judgment that CPI has infringed one or more claims of Saint-Gobain Crystals' Patents under all applicable provisions of Title 35, United States Code;

2. An award of damages to compensate Plaintiffs for CPI's infringement, including damages pursuant to 35 U.S.C. § 284, as well as prejudgment and post-judgment interest;

3. A judgment and order finding this to be an exceptional case and requiring CPI to pay the costs of this action (including all disbursements) and attorneys' fees as provided by 35 U.S.C. § 285.

4. A judgment and order that CPI, its officers, directors, employees, agents, and all those acting in concert with CPI be enjoined, pursuant to 35 U.S.C. § 283, from all future activities infringing the Asserted Patents, and/or inducing or contributing to the infringement of the Asserted Patents; and

5. Such other and further relief that the Court deems just and proper.

DEMAND FOR JURY TRIAL

Plaintiffs hereby demand a trial by jury as to all claims triable of right to a jury.

Dated: September 3, 2021

/s/ Dennis P. Waggoner

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