

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

CREE, INC.,

Petitioner

v.

DOCUMENT SECURITY SYSTEMS, INC.,

Patent Owner

Patent No. 7,256,486

IPR2019-00506

**DECLARATION OF JAMES R. SHEALY, Ph.D IN SUPPORT OF
PETITION FOR *INTER PARTES* REVIEW OF U.S. PATENT NO. 7,256,486**

I. INTRODUCTION

1. My name is James Richard Shealy, Ph.D.

2. I make this declaration in support of Petitioner Cree, Inc.'s ("Petitioner") petition for *inter partes* review of U.S. Patent No. 7,256,486 ("the '486 patent," Exhibit 1001), IPR2019-00506.

3. I am over 21 years of age and otherwise competent to make this declaration.

4. Although I am being compensated for my time in preparing this declaration, the opinions herein are my own, and I have no stake in the outcome of the *inter partes* review proceeding.

5. I am not an employee of Petitioner or any affiliate or subsidiary thereof.

6. This declaration summarizes the opinions I have formed to date. I reserve the right to modify my opinions, if necessary, based on further review and analysis of information that I receive subsequent to the filing of this report, including in response to positions that parties to the *inter partes* review proceeding, or their experts, may take that I have not yet seen.

II. MY EXPERIENCE AND QUALIFICATIONS

7. I have been involved in the science and engineering of light emitting diodes for almost 40 years, as detailed in my *curriculum vitae* (attached as Appendix A).

8. I received a B.S. degree from North Carolina State in 1978, an M.S. from Rensselaer Polytechnic in 1980, and a Ph.D. from Cornell in 1983.

9. I joined the Cornell faculty in 1987 and am currently a professor in the School of Electrical and Computer Engineering.

10. I have been deeply involved in the research and design of LEDs over the course of my career. In 1978, I joined the technical staff of General Electric's Corporate Research and Development Center under an Edison Fellowship. While there, among other work, I developed GaAs epitaxial materials for high voltage electronics. I also researched device fabrication by organometallic vapor phase epitaxy ("OMVPE").

11. In 1980, I transferred to General Electric's Advanced Electronics Laboratory, where I developed materials and processes for the fabrication of AlGaAs LEDs as well as developing an OMVPE reactor and related processes for the fabrication of AlGaAs quantum well laser diodes. They were the highest power, lowest threshold devices at the time. The AlGaAs LEDs were developed in my group: from materials to device fabrication to a variety of packaging solutions.

The packages included lead frame packages, hermetically sealed metal and ceramic packages, and packages which combined the LED with a silicon photo transistor (commonly referred to as an opto-coupler). These packages included wire bonds to pads on the LED and on the package, silver epoxy die mounts, eutectic preform die mounts, LED passivation, reflectors, and focusing lenses integrated into the package assembly. In 1985, I was designated Principal Staff Scientist at General Electric in recognition of my research contributions.

12. For a portion of my time at General Electric, I was also concurrently working at Cornell. In 1984, my group at Cornell developed the first single quantum well red laser by OMVPE. I then joined the Cornell faculty in 1987 and have continued my research in OMVPE, particularly as it relates to LEDs, laser diodes, and high frequency transistors. During this time, high performance AlGaInP red laser diodes and LEDs were realized. The red LEDs were packaged on metal submounts with an integral reflector and focusing lens to couple the LED emission into plastic optical fiber bundles. I have also researched GaN and related materials for both LEDs and high power transistors.

13. In 1997, I was named the Director of Cornell's Optoelectronics Technology Center. In 1998, I was promoted to full professor at Cornell. I have published in excess of 100 articles, and I am the inventor of over 15 patents, many of which deal with GaN-based materials and devices. Many of the GaN-based

LEDs on which I worked were realized on defect-free GaN pyramidal p-n junctions with quantum well active regions. I have remained current in the field, as evidenced by my publications listed in my *curriculum vitae*.

14. I have also previously testified in a number of patent infringement proceedings, including relating to LEDs, including materials growth, device fabrication, and their packaging.

15. I have used my education and experience researching, publishing and working in the LED field, and my understanding of the knowledge, creativity, and experience of a person having ordinary skill in the art, in forming the opinions expressed in this declaration, as well as any other materials discussed herein.

III. MATERIALS CONSIDERED

16. In forming my opinions, I read and considered the '486 patent and its prosecution history, the exhibits listed in the Exhibit List filed with the petition for *inter partes* review of the '486 patent, as well as any other material referenced herein.

17. For any future testimony I may give in this matter, I may use some or all of the documents and information cited to, referred to, and identified in this declaration, as well as any additional materials that are entered into evidence in this matter.

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