Inkjet printed PbS quantum dot device for in-space application

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Abstract (in 12 Pt Arial Font)

Additive manufacturing offers advantages over conventional manufacturing in the areas of customization, weight, and sustainability. Detection of infrared light is critical to several applications, from environmental monitoring and remote sensing, energy harvesting, optical communication, surveillance, and medical imaging modalities. Typically, IR sensors are made from compound semiconductors, and they require complex material growth and fabrication facilities. Advances in nanotechnology have enabled a new class of materials that circumvent these problems. Semiconductor nanoparticles, also known as quantum dots, have been investigated heavily due to their solution processibility, tailored spectral absorption, and high internal quantum efficiency. There have been many reports of using these quantum dots in photovoltaics, light-emitting diodes, photodetectors, etc. Here we present a low-cost, scalable, and deployable photoconductor using additive manufacturing techniques. Iodide-passivated lead sulfide quantum dots were synthesized in a single-step process. Then a ternary solvent ink was formulated with properties suitable for stable inkjet printing using a commercially available Fujifilm DIMATIX printer. One of the key discoveries novel to lead sulfide quantum dot devices is the measurement of negative photoconductivity when illuminated with broadband sources.

Biography of Presenter (in 12 Pt Ariel Font)

Mark Ciappesoni is a PhD student at the University of Miami pursuing a degree in Electrical and Computer Engineering. Mark graduated with a bachelor's degree in Electrical and Computer Engineering from the University of Miami in 2017 summa cum laude.Mark's research interests include nanotechnology, additive manufacturing, optoelectronic and electronic devices, and micro/nanofabrication.