

2026 HBCU CHIPS Network Conference

Contribution ID: 52

Type: ORAL

Using Q-Switched Lasers for Multi-Beam Multi-Target Pulsed Laser Deposition of Photonic High-Entropy Alloy Films

Wednesday, April 1, 2026 2:45 PM (20 minutes)

Presentation describes the application of Q-switched lasers to the concurrent multi-beam multi-target pulsed laser deposition (CMBMT-PLD) of the high-entropy alloy (HEA) films. A six-beam system included permanent magnets under the PLD targets and the substrate and a substrate heater. Magnets narrowed down the plasma plumes from the targets and increased the material deposition rate. Three- (Au-Ag-Cu), four- (Au-Ag-Cu-Al), five- (Au-Ag-Cu-Al-Ti), and six-metal (Au-Ag-Cu-Al-Ti-W) films were deposited on Cu, Al, Fe, and Ni substrates. Scanning electron microscopy and X-ray analysis indicated the films were the aggregates of crystalline nanoparticles (NPs) of mostly individual metals and double-metal alloys. Heating the substrates up to 300°C resulted in the formation of a wider variety of double-alloy nanoparticles due to higher mobility and reactivity of the deposited atomic species. The HEA films amplified the photoluminescence (PL) of the perovskite CsPbBr₃ quantum dots (QDs) deposited on the top by 6 to 16 times. This was because of two simultaneous effects: the enhancement of the incident ultraviolet radiation (372-nm wavelength laser) by the localized surface plasmon polariton resonance in the metal NPs surrounding the perovskite QD, and the fast decay of the excited state of the QD due to resonant coupling between the QD and near vicinity NPs.

Academic or Professional Status

Faculty

Authors: Prof. DARWISH, Abdalla (Dillard University); Dr PATEL, Darayas; ROSSMANITH, David (Dillard University); Dr MELLE, Paolo; Dr SARKISOV, Sergey

Presenter: ROSSMANITH, David (Dillard University)

Session Classification: Technical Session 2

Track Classification: Materials & Devices: Materials & Devices - (b)