Contribution ID: **5** Type: **Oral Presentation**

Lead Halide Perovskite Nanocomposite Scintillators

Thursday, 20 July 2023 12:10 (20 minutes)

Lead halide perovskite (LHP) nanocrystals show promise as scintillators due to their high atomic number, bright luminescence and tunable emission wavelength. Here, we present nanocomposite scintillators which consist of formamidinium lead halide perovskite nanocrystals in a polymer matrix. Mixed-halide $FAPbBr_{3x}Cl_{3(1-x)}$ nanocrystals were synthesised by a room-temperature solution-growth method which allowed for rapid, low-cost production. Luminescence spectra, time response and Stokes shifts were measured for each different nanocrystal composition so as to select the most appropriate LHP nanocrystal for inclusion in the nanocomposite scintillator: the ideal nanocrystal would have bright, fast emission at a wavelength close to the to the maximum efficiency of a photomultiplier tube and would also have a large Stokes shift so as to minimise reabsorption of the scintillation light.

Nanocomposite scintillators were then produced which contained LHP nanocrystals in a matrix of either PMMA or the plastic scintillator EJ-290. A significant challenge in producing uniform, transparent nanocomposite materials is the effect of optical scattering, which leads to an increase in the opacity of the scintillator with increased effect when the scintillator is thicker, contains a higher loading of nanocrystals, or contains larger particles. Here, the size of the LHP nanocrystals was minimised and a partial ligand exchange procedure was investigated as a strategy to prevent nanocrystal aggregation. The thickness and nanocrystal loading of the composites were then investigated so as to balance the transparency of the scintillator to visible light with the attenuation of high-energy photons.

Primary author: Dr BRADDOCK, Isabel (Science and Technology Facilities Council)

Co-authors: Dr AL SID CHEIKH, Maya (University of Surrey); Dr GHOSH, Joydip (University of Surrey); MULHOLLAND, Roma (University of Surrey); Mr O’NEILL, Joseph (University of Surrey); Dr RICHARDS, Sion (Science & Technology Facilities Council); Dr STOLOJAN, Vlad (University of Surrey); WILSON, Matthew (STFC); Dr CREAN, Carol (University of Surrey); Prof. SWEENEY, Stephen (University of Glasgow); SELLIN, Paul

Presenter: Dr BRADDOCK, Isabel (Science and Technology Facilities Council)

Session Classification: Session 2

Track Classification: default track