# Novel TMOS-Dependent Synthesis of Water-Stable CsPbBr3-SiO2 Nanoparticles for Bioimaging Applications

Lam, Katherine (School: University High School)

Perovskite nanocrystals carry significant promise in the field of intracellular sensing. When in proximity with radiolabeled analytes, fluorescent nanoparticles emit photoluminescent signatures that can be used to quantify and locate intracellular species, whilst minimally disrupting the structure and/or function of these target molecules. However, existing perovskite nanosynthesis methods have been hampered by high reagent costs, the consumption of large quantities of toxic organic solvents, and rapid particle degradation in aqueous environments, such as those encountered within living cells. Here, the reagent tetramethylorthosilicate (TMOS) is investigated as a means to enhance the aqueous stability and optic properties of CsPbBr3 perovskite nanoparticles, compared to traditional, more costly fluorocarbon reagents (such as 1H,1H,2H,2H-perfluorooctyldimethylchlorosilane). The ability of TMOS to preserve and increase perovskite signal intensity through a proposed CsPbBr3-SiO2 core-shell mechanism suggests new opportunities for the use of nanocrystal biosensors in cost-efficient, multiplexed analysis of small-molecule signaling cascades, potentially offering unique spatiotemporal insights into the in vivo origins of known pathological phenotypes.

**Awards Won:**

American Chemical Society: Third Award of $2,000

University of Arizona: Renewal Tuition Scholarship