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Surface energy stabilization of cubic crystal phase in organic-inorganic Perovskite quantum dots at low temperatures. SOM SARANG, Univ of California - Merced, SARA BONABI, Univ of California - Santa Cruz, PARVEEN KUMAR, VINCENT TUNG, MICHAEL SCHEIBNER, Univ of California - Merced, JIN Z. ZHANG, Univ of California - Santa Cruz, SAYANTANI GHOSH, Univ of California - Merced — Surface energy manipulations have led to modification of the crystal phase diagram of a nanoparticle, leading to unusual physical properties at low temperatures. In this work, we use low temperature photoluminescence (PL) as a framework to study phase transitions in $CH_3NH_3PbBr_3$ Perovskite quantum dots (PQDs) ligated with Octylaminebromide and 3-aminopropyl triethoxysilane At low temperatures (<140 K), P-OABr undergoes phase transition from tetragonal to orthorhombic phase as seen from the emergence of a higher energy band (˜2.64eV) in the PL spectrum, while no phase transition is observed in P-APTES even at temperatures as low as 20 K. The absence of phase transition results from differences in surface energy stabilization, a prominent factor in quantum dots due to their nanoscale morphology and surface ligation. Using time resolved PL, at room temperature we observe a bi-exponential exciton recombination in P-OABr and P-APTES with average lifetimes of 3.5 ns and 6.9 ns respectively, while at temperatures <140 K, the emerging high energy orthorhombic band has a lower recombination lifetime of the order ˜300 ps. Our findings bring in new aspects of PQD phase stabilization linked to nanoscale morphology and surface energy manipulation

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