Physical and Chemical Modifications of Nanomaterial-Chiral Molecule Interface for Enhanced Chirality-Transfer

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Nanostructured semiconductors have already shown to provide superior optical properties, such as tunable wavelength and high intensity of absorption or emission of light, for opto-electronic devices compared to their bulk counterpart. An emerging area of research is to also control the circular polarization of absorption and emission states. Typically *achiral* organic molecules are used as passivation ligands for colloidal nanomaterials. Semiconductor nanomaterials interfaced with *achiral* molecules show no tuneability of the polarization state of absorbed or emitted photons, in the absence of external fields. But, experimentally it has been observed that interaction of semiconductor nanomaterials with *chiral* molecules induces polarized optical signatures (chiroptical activity). Specifically, *chiral enantiomers* (ie handedness) interfaced with the semiconductor nanomaterial can provide equal and opposite polarized optical signals originating from the nanomaterial (i.e. chirality transfer)**.** This provides opportunities to develop photo-detectors which are sensitive to the polarization state of incoming photons along with novel photo-diode device architectures for processing optical signals. In the context of semiconductor-organic molecular interface, we want to understand what material and molecular properties are most important for enhancing the intensity of polarized optical signatures induced by chirality transfer. Here we explore chirality-transfer in lead-halide perovskite and lead chalcogenide quantum dots with chiral carboxylic and ammonium molecules bound to their surface. Material properties, such as effective mass, and chemical properties, such as molecular polarity, which enhance intensity of chiroptical signatures will be discussed.