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Improved Dispersion of $CuInS_2$/ZnS Quantum Dots in Poly(methylmethacrylate) for High Performance Luminescent Solar Concentrators. JUSTIN DOYLE, DANIEL KORUS, MAYA NOESEN, MEREDITH BOXX, KAYLA KOCH, YONGJUN CHEN, MEGAN PLUMMER, DAVID RIDER, STEPHEN MCDOWALL, DAVID PATRICK, Western Washington University — Luminescent solar concentrators (LSCs) use down-converting luminophores embedded in a waveguide to absorb sunlight and deliver high irradiance, narrowband output light for driving photovoltaic (PV) and other solar energy conversion devices. Achieving a technologically useful level of optical gain requires bright, broadly absorbing, large-Stokes-shift luminophores incorporated into low-loss waveguides, a combination that has long posed a challenge to the development of practical LSCs. With the recent introduction of a new generation of broadband, high-brightness, giant effective Stokes Shift phosphors based on materials such as $CuInS_2$ and Mn:ZnSe nanocrystals (NCs), LSCs have come closer to commercial viability. However a key remaining challenge concerns incorporation of NCs into technologically-relevant waveguide materials, especially poly(methylmethacrylate), where aggregation occurs at even very low loadings, leading to unacceptable light-scattering losses. This poster describes a strategy for achieving uniform dispersion at even high NC loading, by substituting native NC ligands for diblock poly(styrene)-poly(methylmethacrylate) oligomeric ligands. Using this strategy we describe $CuInS_2$/ZnS-based LSCs demonstrating outstanding performance as large-area, semitransparent concentrators suitable for use in energy-harvesting window layers and related applications.

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