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Transparent Luminescent Solar Concentrators for Large-area Solar Windows YIMU ZHAO, RICHARD LUNT, Michigan State University — Luminescent solar concentrators (LSCs) have recently regained attention as a route for integration into the building envelope. To date, however, these systems have been limited to absorption and emission (glow) in the visible part of spectrum. We have designed and fabricated novel transparent luminescent solar concentrators devices composed of synthesized metal halide nanocrystal phosphorescent luminophores that allow for efficient and selective harvesting of ultraviolet (UV) photons with a near perfect absorption cutoff at the edge of the visible spectrum (430nm) while efficiently down-converting emitted light with a massive stoke shift to the near-infrared (800nm). We have demonstrated transparent LSCs with power efficiency of 0.8% $\pm$ 0.5%, system external quantum efficiency exceeding 35%, and an average transmittance of 82% $\pm$ 1%. We show through experiments and modeling that this architecture has the potential to exhibit up to 1-2% power conversion over module areas > 1 m^2. These concentrators present new opportunities for non-tinted and highly-adoptable solar- windows that can translate into improved building efficiency, enhanced UV-barrier layers, and lower cost solar harvesting systems.

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