

GREEN TO DEEP-UV LIGHT: PUSHING THE ANTI STOKES SHIFT IN PHOTON UPCONVERSION BY BREAKING KASHAS RULE

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In photovoltaics, a significant portion for the solar spectrum is lost in modern day single junction solar cells, as the energetically lower portion below the solar cells bandgap cannot be utilized for electricity generation. While multi-junction solar cells can overcome this issue, their production results in a much higher cost, making these systems unviable for some applications. Other approaches are thus being investigated to harvest this energetically lower portion of the solar spectrum. Upconverting systems can generate high-energy photons from lower energy sources, usually by combining two photons with a lower energy into one. Triplet-triplet annihilation upconversion has received increased interest in recent years due to its ability to perform well at low light intensities and its relatively low toxicity. In this presentation, we will talk about a new way of achieving the highest possible anti-Stokes shift, meaning the gain in photon energy, by utilizing anti-Kasha materials. These materials emit from higher electronic states than the conventional emission from the first excited singlet state, S_1 , which is found in most materials. We discuss our experimental findings for both S_2 and S_3 emitting systems and discuss possibilities beyond solar cells for photon upconversion systems.
