
Upconversion and downconversion, can be applied on improving light harvesting of silicon solar cells?

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Upconversion and downconversion are both nonlinear photoluminescent processes. It is expected that down-conversion and upconversion can be applied on broadening harvesting of near infrared or ultraviolet light, thus boosting the power conversion efficiency (PCE) of silicon solar cells (SSCs) as well as other solar cells. These imagines were assumed in 1990s, but there has been no essential development for a long time. In 2017, we reported CsPbCl₃:Yb³⁺ perovskite downconversion nanocrystals, which improved 3-4% of the power conversion efficiency of c-silicon solar cells. Recently, we also achieved breakthrough on applying upconversion nanocrystals to improve PCE of the SSCs. A core shell design of upconversion nanocrystals based on multi RE ions can efficiently transfer near-infrared 1100-2100 nm lights to 980 nm, obviously improve the PCE of SCCs under irradiation of standard solar light.



Short Bio:

Hongwei Song Prof of Jilin University, studied on the field of optoelectrical materials and devices. So far, he has published more than 460 papers in SCI journals and 4 book chapters. These publications have been totally cited more than 20000 times.