



Application of Phosphor Materials as Spectral Converter for Si Solar Cells enhancement

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Researches on the possibility of enhancement of the performances of the existed commercial solar cell have drawn a lot of attention in recent decades. Major obstacles examined by the solar cells are the losses due to the spectral mismatch. One of the losses is known to be as a result of transparency of the band gap of the solar cell due to the low energy incident photons, and can be solved by using a suitable spectral converter utilizing up-conversion mechanism. The second major type is when the incident photons have a higher energy than the band gap which causes a thermalization of the solar cell and the incident photons will dissipate their energy as heat. The later thermalization loss is attributed for the majority of the loss due to the spectral mismatch. This loss can be reduced through using a suitable luminescent layer able to convert the high energy photons like ultraviolet or blue photons into two lower energy photons through quantum cutting or down-conversion processes.

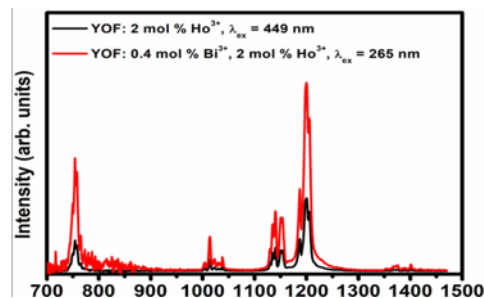
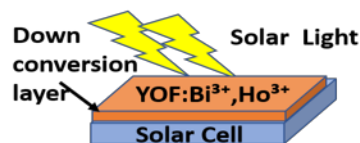


Illustration of the Down-conversion YOF:Bi³⁺,Ho³⁺ layer on top of the solar cell, and the emission luminescence YOF:Bi³⁺,Ho³⁺ phosphor.