Synthesis and characterisation of Bi^{3+}:Yb^{3+} co-doped Y_2O_3 phosphor for enhancing the efficiency of Si solar cells.

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Solar cells are gaining in popularity as they enable the ability to generate sufficient and clean energy. Crystalline silicon (c-Si) based solar cells are the most widely used as they are the cheapest to produce but suffer from low energy efficiency at around 15 %. The low efficiency is largely attributed to the poor spectral response of Si solar cells to the solar spectrum. Photons having energies higher than the band gap of the solar cell will lose the additional energy in the form of heat and lower energy photons are not absorbed. One way to reduce the spectral mismatch and improve the efficiency of c-Si solar cells is to modify the solar spectrum through down-conversion (DC) or up-conversion (UC). Previous research on Y_2O_3 co-doped with Bi^{3+} and Yb^{3+} has shown promising results for DC applications and enhancing the efficiency of c-Si solar cells. Thus the main goal of this study is to synthesis and investigate the luminescent properties of Bi^{3+}:Yb^{3+} co-doped Y_2O_3 phosphor for possible application in solar cells.

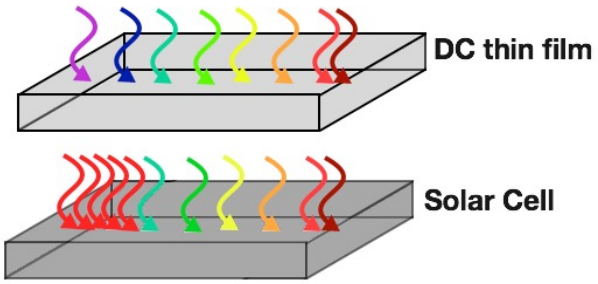

Fig 1: Downconverting thin film for converting high energy photons into multiple low energy photons.

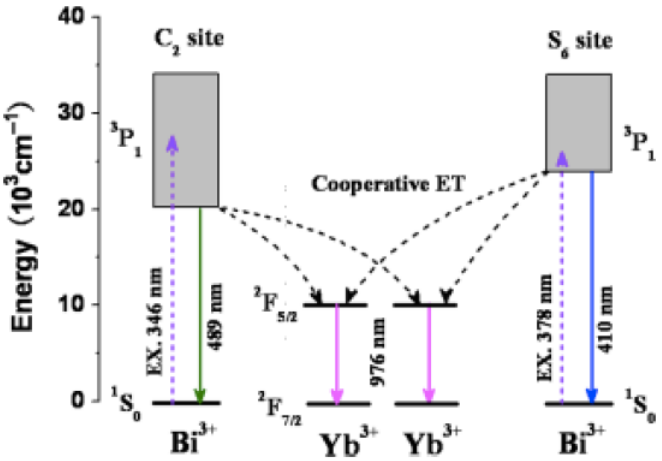

Fig 2: Energy transfer mechanism for Bi^{3+}:Yb^{3+} co-doped Y_2O_3 phosphor.