

Photoactive boron-oxygen complexes in silicon solar cell

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Silicon solar cell currently dominates the global photovoltaic industry with a market share of more than 90% of world production of solar cells. Improvement on the silicon solar cell efficiency thus has significant economic implications. It is known that the boron-doped Czochralski silicon cells can lose up to 10% of their initial energy-conversion efficiency due to illumination-induced formation of carrier recombination centers. These recombination centers had been identified as boron-oxygen-dimer (BO_2) impurity complexes. In this talk, I will show that the BO_2 complex is formed by the light-induced oxygen dimer diffusion in silicon and that the carrier recombination at the BO_2 complex is enhanced by the bistability of the BO_2 structure. Our theoretical model can explain a number of experimental observations.