Enhanced of electron transport rate by using blocking layer of W-doped TiO_2 in dye sensitized solar cells

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The photo-generated electron is injected from the lowest unoccupied molecular orbital of photosensitizer into the conduction band level of TiO2, and then transferred to the conductive transparent electrode. In this work, W-doped TiO2 is introduced as blocking layer with various amount of tungsten dopant. The conduction band of W-doped TiO2 moves toward lower energy level with the increase in the amount of W dopant. The downshift of blocking layer conduction band can accelerate the transport rate of photo-generated electron. W-doped TiO2 blocking layers are deposited on transparent electrode by spin coating. W-doping leads to increase the short circuit current density due to the enhancement of charge transport rate. However, it causes the decrease in the open circuit voltage because the probability of charge recombination tends to increase with the increase in the amount of W dopant. In this competition, 3 % W-doped TiO2 exhibits best photovoltaic performance of DSSCs, with showing highest short circuit current and moderate open circuit voltage.