

Dye-sensitized solar battery as a new type of photo-rechargeable battery

이명희, 김병만, 권태혁, 송현곤†

울산과학기술원

(philiphobi@hotmail.com†)

Photo-rechargeable batteries (PRBs) have been developed as all-in-one energy devices having a merit that both energy harvesting and storage are realized. A major portion of the PRBs are based on nonfaradaic (capacitor-like) storage. Only very limited number of works have focused on the use of faradaic (battery-like) storage even if it is much superior to the capacitor-like one in terms of energy densities. Herein, we introduce dye-sensitized solar batteries (DSSBs) as a novel PRB using battery-like storage. The DSSB are based on the principle of dye-sensitized solar cells (DSSCs) for energy harvesting and redox reactions for energy storage. However, it is not the simple physical combination of DSSC and rechargeable battery. We successfully embodied the DSSB cell with a cobalt complex as catholyte and LiMn_2O_4 as immobilized anolyte. The cell had the working voltage at 0.35 V with coulombic efficiency (CE) at 94 to 100 % over 30 cycles. Its rate capability was quite good up to the discharge current at 200 uA cm^{-2} , recording the CE at 75 % and the capacity at 81 %. Above all, the DSSB was contrasted with the capacitor-based PRBs by enhancing self-discharge behavior.