

Synergistic Performance Enhancement of Multi-walled Carbon Nanotube-Based Dye-Sensitized Solar Cells Using Oxygen Plasma Treatment

진준형[†], 박준희¹, 성수환¹, 이강열², 송민정³

경기대학교; ¹경기대학교 화학공학과; ²경기대학교 산학협력단; ³서경대학교

(jjh1023@kgu.ac.kr[†])

Oxygen plasma treatment is a widely used process providing commonly inactive nano electrode surface with various oxygen-containing chemical functional groups including hydroxyl, carboxylic acid and aldehyde groups. The plasma treated nano surface can be easily modified with alien materials having unique properties because functional groups on the surface allow strong and stable chemical bonds between the nano surface and the alien materials. In this work, Oxygenated multi-walled carbon nanotubes (OMWNTs) are employed as additives in conventional TiO₂-based photoanodes and platinum-free conducting polymer-based photocathodes. The OMWNT-modified PEDOT:PSS photoanode shows enhanced energy conversion efficiency by about 14 % and the OMWNT-modified photocathode enhances the efficiency by about 26 %. More importantly, a 43 % efficiency is obtained by utilizing both OMWNT-modified electrodes together indicating that the synergistic effect by the used of the two electrodes together seems to be related to the effective suppression of unwanted back transport and recombination reactions.