

Multi Wall Carbon Nanotube-modified Iron Oxide Electrode for Photoelectrochemical Application

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The MWCNT-modified Fe_2O_3 electrode was well made through spray coating of MWCNT and e-beam evaporation of iron particles on FTO coated glass. The growth and light absorption characteristics of Fe_2O_3 were not affected by the modification of MWCNT. The electrode had layered structure of FTO, MWCNT, and Fe_2O_3 . The photocurrent increases by 66 % in the MWCNT-modified Fe_2O_3 electrode than in the unmodified electrode at 0.23 V vs. Ag/AgCl which is potential necessary for water oxidation at pH 13.8. In potentiostatic EIS, we could observe the dramatically increased capacitance at the Fe_2O_3 | FTO and the decreased resistances over the MWCNT-modified Fe_2O_3 electrode. It explains the role of the MWCNT layer as an expressway for electrons which helps not only charge transfer in the Fe_2O_3 layer but also charge separation over the entire electrode. In Mott-Schottky analysis, flat band potential of the Fe_2O_3 electrode was shifted to more positive potentials in the MWCNT-modified case and it confirmed charge migration from the Fe_2O_3 layer to the MWCNT layer. It also showed good agreement with the result about onset potential of photocurrent.