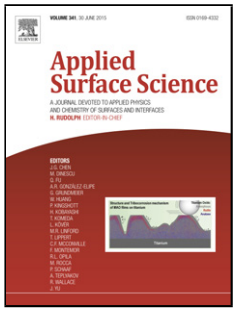

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Optical, electrical and electrochemical evaluation of sputtered platinum counter electrodes for dye sensitized solar cells

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Abstract

Since Grätzel and O'Regan started in 1991, dye-sensitized solar cells (DSSC) have been extensively studied around the world. In addition to increasing efficiency, their characteristics such as low cost materials and inexpensive manufacturing processes are attractive for organic solar cells. Several parts of DSSC devices are being researched such as semiconductor engineering, low cost counter electrodes, electrolytes, and dyes. In this work, platinum (Pt) thin films were deposited by sputtering technique to produce counter electrodes for DSSC. The films were characterized by profilometry, elipsometry, four point probe sheet resistance, spectrophotometry, and electrochemical impedance spectroscopy. The electrode response was also compared to that built from a commercial platinum solution. The results allow us to determine the minimum Pt film thickness necessary to achieve a relevant reduction of the sheet resistance and charge transfer resistance, which preserve a significant electrode transparency. The 22 nm and 24.8 nm thick films combined low charge transfer resistance and good transparency. The 122 nm Pt film presented the lowest charge transfer resistance.

Keywords*: Energy conversion, solar energy, DSSC counter electrode, platinum catalytic thin film.*