

[<< Voltar](#)

Ref.: 16-018

## Study of obtaining ZnO film for application in dye-sensitized solar cells using the doctor blade method.

Apresentador: Eguiberto Galego

Autores (Instituição): Galego, E.(Nuclear and Energy Research Institute); Sakata, S.K.(Instituto de Pesquisas Energeticas e Nucleares (IPEN) -); Serna, M.M. (Instituto de Pesquisas Energéticas e Nucleares); Faria, R.N.(Instituto de Pesquisas Energéticas e Nucleares);

Resumo:

The conversion of solar energy into electricity is considered one of the best sustainable technologies for the future replacement of traditional methods of generating electrical energy, such as thermoelectric and nuclear plants. Photovoltaic conversion is the generation system with the greatest potential for growth to meet growing demand, which includes dye-sensitized solar cells (DSSC). DSSC is notorious for mimicking photosynthesis, which mainly focuses on generating electricity under any light intensity. The DSSC is composed by: a semiconductor oxide layer (SO), that functions as a support for the adsorption of a dye; this set is encapsulated between two translucent electrodes and; the space between them is filled with a specific electrolyte. The DSSC, being translucent, acquires the color of the adsorbed dye, which gives it a colorful appearance, a desirable characteristic for applications such as: decorative and architectural objects, among others. The dye is the active element in DSSC and, to have the best possible performance, the dye must be exposed to lighting over the largest area possible. To achieve this, the OS film must have a nanometric porous structure that will guarantee a greater apparent exposure area. This structure is obtained using a mixture of semiconductor oxide with organic products which, after heat treatment, are eliminated. This work aimed to study the influence of organic compounds: polyethylene glycol, ethyl cellulose and glycerin, on the paste viscosity for application by the doctor blade (DB) technique and on the efficiency of DSSC. The pastes were prepared using nanoparticulate ZnO (< 100 nm) in the following compositions: (a) ZnO

+ ethyl cellulose + terpineol (0.2 g + 0.1 g + 0.5 mL); (b) ZnO + PEG 400 G (0.3 g + 0.3 m?) and; (c) ZnO + liquid glycerin (0.3 g + 0.3 mL). All mixtures were homogenized in an agate mortar and rested for 24 h. Afterwards, they were applied to a glass electrode (FTO) by DB, with a defined area of 8 x 8 mm and subjected to heat treatment: from room temperature to 450 °C with a heating rate of 5 °C min<sup>-1</sup> maintained for 1h. Then, the samples were sensitized in the dye N719 for 16h. Next, sealed DSSCs were assembled using an FTO+Pt counter-electrode and filled with electrolyte (I-/I<sup>3+</sup>-). The electrical parameters were obtained from the IV curve obtained under lighting of 100 mW cm<sup>-2</sup>, air mass: 1.5 G. From the point of view, the applicability by DB, paste (a) presented best result evaluated by ease of application and homogeneity in green. However, electrical parameters revealed that using paste (c) presented the highest short-circuit current value (I<sub>sc</sub>) however, lowest conversion efficiency  $\eta = 0.49\%$ ; pastes (a) and (b) showed similar efficiency:  $\eta = 0.58\%$  and  $\eta = 0.56\%$ . The paste (a) was chosen for future application and studies.