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## Preparation of Platinum (Pt) Counter Electrode Coated by Electrochemical Technique at High Temperature for Dye-sensitized Solar cell (DSSC) Application

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Platinum (Pt) counter electrode was coated by electrochemical method as high surface area and abiding adhere to substrate. Electrochemical system consist the dc power supply control, heating to electrolyte solution and substrate holder can adjust distance of electrode. Electrolyte solution was synthesized by platinum (IV) chloride ( $\text{PtCl}_4$ ) powder (purity, 99.9 %) dissolved in hydrochloric acid solution (HCl, 0.00156 M, purity of 99.99 %). The Pt films were deposited on the FTO substrate. Electrolyte concentration and the distance between positive and negative electrode (2 cm) were fixed under stir with magnetic stirrer continuously. The deposition time of 10, 30 and 60 minutes, the coating current of 5, 10, 15 and 20 mA and temperatures of 25, 30 and 40 °C, respectively were varied. The surface morphology and optical properties of the Pt film was analyzed by digital microscopic and UV-vis spectrophotometer. Results, the Pt films exhibit uniform surface area highly for the conditions the coating current of 5, 10, 15 and 20 mA, the deposition time of 30 and 40 minutes at 40 °C. Transmittance values of Pt films deposited on FTO substrate has approximately of 5 to 50 % show that occur high reflection corresponding to dye molecule absorption increases. DSSC device was fabricated from the  $\text{TiO}_2$  standard and immersed in dye-sensitizer (N719) for 24 hours. After, the  $\text{TiO}_2$  working electrode complete sandwich the Pt counter electrode and injected iodide electrolyte solution. The efficiency of DSSC cell was measured by solar simulator (AM 1.5). Efficiency value obtains as high as 5.91 % for the coating current, deposition time and solution temperature of 15 mA, 30 minutes and 40 °C, respectively. Summary, influence of temperature effects efficiency increasing. Pt counter electrode coated by chemical method can be prepared easily and the suitable usefully for DSSC application.

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