

## Synthesis and Characterization of Ionic Liquid Crystals Based on *Fatty Imidazolinium* as Redox Electrolyte for Dye-Sensitized Solar Cell (DSSC)

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### Abstract

The aim of the research is to produce ionic liquid crystals from local renewable resource for dye-sensitized solar cell (DSSC). Ionic liquid crystal system that expected to synthesized is iodide salt from fatty imidazolinium. The research produce three compounds of fatty imidazolinium iodide with different cation structure, i.e. palmitic imidazolinium iodide (Pal-ImzI), stearic imidazolinium iodide (St-ImzI), and cis-oleic imidazolinium iodide (Ol-ImzI). All compounds are synthesized from fatty acid and dietilentriamina (DETA) using green method with irradiation microwave and methylation with methyl iodide. Characterization using Infrared Spectroscopy (FTIR) and Proton Nuclear Magnetic Resonance ( $^1\text{H-NMR}$ ) is suitable with expected compounds. Analysis of physicochemical properties using Differential Scanning Calorimetry (DSC) shows existence of mesophase by Ol-Imz I at 82,58–151,50°C. Physicochemical analysis using Thermal Gravimetry-Differential Thermal Analysis (TG-DTA) show that these compounds have high thermal stability with decomposition temperatures for each compounds are 368,6°C for Pal-ImzI; 375,5°C for St-ImzI; and 361,6°C for Ol-Imz I. Analysis using cyclic voltammetry (CV) show that these compounds have electrochemical windows approximately 2 V. Analysis using Electrochemical Impedance Spectroscopy (EIS) show that resistance of Ol-Imz is lowest (0,066 kohm.cm<sup>2</sup>) at 25°C, the resistance value of St-Imz I and Pal-Imz I are 3,839 and 1,566 kohm.cm<sup>2</sup>, respectively. Data of physicochemical properties shows that Ol-Imz I is very potential for redox electrolyte in dye-sensitized solar cell (DSSC).

Keyword: DSSC, redox electrolyte, ionic liquid crystals, and *fatty imidazolinium*.