

**UNIVERSITI TEKNOLOGI MARA**

**PREPARATION AND  
CHARACTERIZATIONS OF  
SODIUM IODIDE-SODIUM  
DICYANAMIDE SOLID  
ELECTROLYTE**

**MOHD KHAIRUL HAZWAN BIN  
MOHD YUSOF**

**MSc**

August 2018

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## ABSTRACT

This study sets out to investigate the possibility of using sodium based salt and inorganic ligand compound as solid electrolyte. Binary solid electrolyte system of NaI-NaN(CN)<sub>2</sub> was successfully prepared by Ball Milling method with two hours of optimized milling time. The prepared samples were characterized by Electrochemical Impedance Spectroscopy (EIS), Transference Number Measurement (TNM), Fourier Transform Infrared Spectroscopy (FTIR), X-Ray Diffraction (XRD) and Field Emission Scanning Electron Microscopy (FE-SEM). Highest conducting sample was obtained for 10NaI-90NaN(CN)<sub>2</sub> system where the room temperature conductivity was  $(5.67 \pm 1.26) \times 10^{-4} \text{ S cm}^{-1}$  and it was confirmed an ionic conductor as the ionic transference number was 0.96. Temperature dependent conductivity analysis had revealed that the highest conducting sample obeys Arrhenius rule as the ionic charge carrier species conduction was through some hopping mechanism with lowest activation energy of 0.133 eV. Apart from that, conduction mechanism was found to follow Quantum Mechanical Tunneling (QMT) model. FTIR analysis had suggested some interaction had occurred between NaI charge carrier as the salt component in the binary system with the sodium dicyanamide host material as the duplet C $\equiv$  N spectra emerged into single broader peak at around 2100 cm<sup>-1</sup> wavenumber region. Binary sample had showed to be less crystalline in nature due to decrease in overall intensity and disappearing of several sharp peaks from XRD diffractogram obtained. Finally, FE-SEM micrograph revealed significant difference between unmilled and milled pelletised sample as milled material particles was broken down into smaller size apart from homogenous of powder mixture was achieved.

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