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A STUDY OF CHARACTERISTICS OF  
THIN FILM SOLID STATE CELLS BASED ON  
COPPER(I) ION CONDUCTORS

THESIS SUBMITTED BY

*JEEVANANDA KARUNAMUNI*

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DEPARTMENT OF PHYSICS,  
UNIVERSITY OF PERADENIYA,  
SRI LANKA

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by

J. Karunamuni

ABSTRACT

Thin film solid state cells based on cuprous halides or cuprous sulphate as the electrolyte have been fabricated and their characteristics have been studied. In the case of cuprous halides electrolyte, the use of a thin film of mixed halides appear to improve the performance of the cells, presumably due to the enhanced ionic conductivity caused by the mixed phase grain boundary effect.

The Mg/CuI:CuCl/Cu cell showed a Voc of 1.1 V, Isc of 4.5 mA and a capacity of 1.5 mAh, whereas the Mg/CuI:CuBr:CuCl/Cu cell showed a Voc of 1.3 V, Isc of 10 mA and a capacity of 5 mAh. The Mg/Cu SO<sub>2</sub> /Cu cell showed a Voc of 1.8 V, Isc of 3.5 mA and a capacity of 10 mAh.

Voc, Isc and the capacity of the secondary cell Cu/Cu SO<sub>2</sub> /Na S O<sub>2</sub>, C were 1.5 V, 1.9 mA and 8 mAh respectively. It was possible to subject this cell to a few charge-discharge cycles satisfactorily.

Mg/Mg-mont:Cu SO<sub>2</sub> /Cu cell, using Mg<sup>2+</sup>-ion conducting montmorillonite clay and a Cu<sup>+</sup>-ion conducting Cu SO<sub>2</sub> and electrolytes showed a Voc of 1.8 mV, Isc of 900 μA and a capacity of 8 mAh.

Electrical conductivity of Cu SO has been measured using complex impedance technique. The material is found to be a rather good copper ion conductor with room temperature conductivity of  $5.6 \times 10^{-4} \text{ ohm}^{-1} \text{ cm}^{-1}$  and negligible electronic conductivity. Electrical conductivity of Mg montmorillonite is found to be  $1.7 \times 10^{-5} \text{ ohm}^{-1} \text{ cm}^{-1}$  at room temperature.