SYNTHESIS AND CHARACTERIZATION OF LISICON TYPE IONIC AND MIXED CONDUCTORS, BASED ON Li_4XO_4: X=Si, Ti, Ge

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FOR THE DEGREE OF

DOCTOR OF PHILOSOPHY

IN THE

DEPARTMENT OF PHYSICS,

UNIVERSITY OF PERADENIYA,

PERADENIYA

SRI LANKA

21 November, 1996

Department of Physics

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In this study, the electrical conductivity of the Na_2SO_4-$Na_2(W,Mo)O_4$, $Li_4(Si,Ti)O_4$- Li_3CrO_4 and Li_4GeO_4-$Li_2(Co,Mg)GeO_4$ systems have been studied using complex impedance technique. New solid solutions with LISICON type structure have been found in the $Li_4(Si,Ti)O_4$-Li_3CrO_4 and Li_4GeO_4-Li_2CoGeO_4 systems. These solid solutions exhibit mixed conducting behaviour but with variation of composition, the level of electronic conductivity changes. These are the first materials in the LISICON family to show mixed ionic/electronic conduction.

Further, we have proposed a new qualitative method, the DC polarisation method, for investigating transference numbers in mixed Li^+/e^- conductors. DC polarisation measurements are made using pelleted samples with gold electrodes and the amount of charge stored as a consequence of electrochemical decomposition of the pellet is estimated. Schottky barrier impedances at the sample-electrode interface are also investigated by ac impedance and varying the nature of the electrode materials for the Li_4SiO_4- Li_3CrO_4 system.