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**TITLE**
"DC Conductivity Studies in LiAlO₂ at Intermediate Temperatures and Its Possible Application for the Electrolysis of Water"

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Extended Abstract for a paper to be presented at the 6th International Meeting on Solid State Ionics to be held in Garmisch-Partenkirchen in September, 1987.

**ABSTRACT**
The results of DC conductivity experiments at intermediate temperatures on a material of initial composition Li₅AlO₃ in various environments are reported. These results indicate that, under certain conditions, DC charge conduction in this system is due to the transport of hydroxide ions from the formation of LiOH.

The possible application of this system for the electrolytic decomposition of water vapor is discussed.
DC Conductivity Studies in "Li₅AlO₄" at Intermediate Temperatures and Its Possible Application for the Electrolysis of Water

by

Steven Crouch-Baker, Lie-Yea Cheng and Robert A. Huggins

Extended Abstract for a Paper to Be Presented at the 6th International Meeting on Solid State Ionics Garmisch-Partenkirchen, September 1987

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DC CONDUCTIVITY STUDIES ON "Li$_5$AlO$_4$" AT INTERMEDIATE TEMPERATURES AND ITS POSSIBLE APPLICATION FOR THE ELECTROLYSIS OF WATER

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The ionic conductivity and thermal behaviour of Li$_5$AlO$_4$ have previously been studied in both wet and dry environments (1-3). The results of AC conductivity experiments indicated a large increase in the ionic conductivity of Li$_5$AlO$_4$ in a wet environment in the temperature range 415 - 450°C. Such behaviour was not observed in a dry environment. A similar increase was also found with pure LiOH, and it was suggested (2,3) that the observed conductivity increase in a wet environment is due to the formation, perhaps along grain boundaries, of LiOH, according to the reaction:

$$\text{Li}_5\text{AlO}_4 + 2 \text{H}_2\text{O} = 4 \text{LiOH} + \text{LiAlO}_2$$

Recently, preliminary results concerning the DC conductivity of wet Li$_5$AlO$_4$ samples in an Ar atmosphere have been reported (4). These results were tentatively interpreted in terms of the transport of OH$^-$ through the electrolyte, accompanied by the electrolytic decomposition of water vapor above approximately 1 V at 500°C. In this work, the DC conductivities of both wet and dry Li$_5$AlO$_4$ samples in various gaseous environments are reported. These results are interpreted in terms of both the electrode reactions which are possible at a given applied voltage and the thermodynamic properties of the Li-Al-O-H system (5). In addition, the possible application of the Li-Al-O-H system studied here to the problem of the electrolytic decomposition of water vapor at intermediate temperatures is discussed.

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References
