

AD-A185 489

DC CONDUCTIVITY STUDIES IN LISAL04 AT INTERMEDIATE
TEMPERATURES AND ITS P (U) STANFORD UNIV CA DEPT OF
MATERIALS SCIENCE AND ENGINEERING

1/1

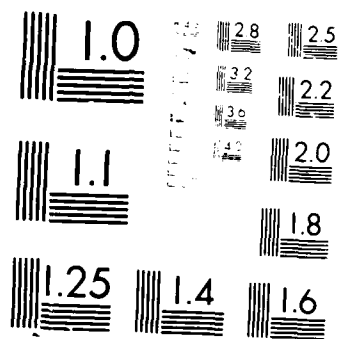
UNCLASSIFIED

S CROUCH-BAKER ET AL 30 JUL 87 TR-4

F/G 7/2

NL





4 COPY RESOLUTION TEST CHART

AD-A185 489

REPORT DOCUMENTATION PAGE

1. REPORT SECURITY CLASSIFICATION UNCLASSIFIED		1b. RESTRICTIVE MARKINGS	
2. SECURITY CLASSIFICATION AUTHORITY		3. DISTRIBUTION/AVAILABILITY OF REPORT Approved for public release; distribution unlimited	
4. DECLASSIFICATION/DOWNGRADING SCHEDULE		5. MONITORING ORGANIZATION REPORT NUMBER(S) N00014-84-K-0648	
6. PERFORMING ORGANIZATION REPORT NUMBER(S) # 4		7a. NAME OF MONITORING ORGANIZATION Office of Naval Research Dr. Harold Guard	
7b. NAME OF PERFORMING ORGANIZATION R.A. Huggins Stanford University		7b. ADDRESS (City, State and ZIP Code) Chemistry Division, Code 413 800 North Quincy Street Arlington, VA 22217	
8a. ADDRESS (City, State and ZIP Code) Dept. Mat. Sci. & Eng. Peterson 5501 Stanford, CA 94305-2205		8b. OFFICE SYMBOL (If applicable)	
9. NAME OF FUNDING/SPONSORING ORGANIZATION		9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER	
10a. ADDRESS (City, State and ZIP Code)		10. SOURCE OF FUNDING NOS. PROGRAM ELEMENT NO. PROJECT NO. TASK NO. WORK UNIT NO. 634-845	
11. TITLE (Include Security Classification) "DC Conductivity Studies in 'Li ₅ AlO ₄ ' at Intermediate Temperatures and Its Possible Appli			
12. PERSONAL AUTHOR(S) Steven Crouch-Baker, Lie-Yea Cheng and Robert A. Huggins			
13a. TYPE OF REPORT Technical		13b. TIME COVERED FROM _____ TO _____	
14. DATE OF REPORT (Yr., Mo., Day)		15. PAGE COUNT	
16. SUPPLEMENTARY NOTATION 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.			
17. COSATI CODES E.L.O. GROUP SUB GR.		18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number)	
19. ABSTRACT (Continue on reverse if necessary and identify by block number) The results of DC conductivity experiments at intermediate temperatures on a material of initial composition Li ₅ AlO ₄ 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.			
20. DISTRIBUTION/AVAILABILITY OF ABSTRACT CLASSIFIED/UNLIMITED ☐ SAME AS RPT. ☐ DTIC USERS ☐		21. ABSTRACT SECURITY CLASSIFICATION D	
22a. NAME OF RESPONSIBLE INDIVIDUAL		22b. TELEPHONE NUMBER (Include Area Code)	
22c. OFFICE SYMBOL			

FORM 1473, 83 APR

EDITION OF 1 JAN 73 IS OBSOLETE.

SECURITY CLASSIFICATION

87 9 23 029

OFFICE OF NAVAL RESEARCH

Contract No. N00014-84-K-0648

Task No. 634-845

Technical Report No. 4

DC Conductivity Studies in " Li_5AlO_4 " 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

Stanford University
Department of Materials Science and Engineering
Stanford, CA 94305-2205

July 30, 1987

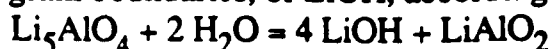
Reproduction in whole or in part is permitted for any purpose of the
United States Government

This document has been approved for public release and sale;
its distribution is unlimited

DC CONDUCTIVITY STUDIES ON "Li₅AlO₄" AT INTERMEDIATE TEMPERATURES AND ITS POSSIBLE APPLICATION FOR THE ELECTROLYSIS OF WATER

S. Crouch-Baker, L-Y. Cheng and R. A. Huggins
Department of Materials Science and Engineering,
Stanford University, Stanford, CA 94305, USA.

The ionic conductivity and thermal behaviour of Li₅AlO₄ 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 Li₅AlO₄ 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:



Recently, preliminary results concerning the DC conductivity of wet Li₅AlO₄ 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 Li₅AlO₄ 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.

Acknowledgement

This work was supported, in part, by the Office of Naval Research.

References

1. I. D. Raistrick, C. Ho and R. A. Huggins, Mat. Res. Bull. **11**, 953 (1976).
2. R. T. Johnson, Jr., R. M. Biefeld and J. D. Keck, Mat. Res. Bull. **12**, 577 (1977).
3. R. M. Biefeld and R. T. Johnson, Jr., J. Electrochem. Soc. **126**, 1 (1979).
4. S. Crouch-Baker and R. A. Huggins, submitted to J. Electrochem. Soc.
5. S. Crouch-Baker and R. A. Huggins, this conference.



A-1

END

DATE

FILMED

DEC.

1987