Enhancement of the Grain Boundary Conductivity in Ceramic Li$_{0.34}$La$_{0.55}$TiO$_3$ Electrolytes in a Moisture-free Processing Environment

Frederic Aguesse, Juan Miguel López del Amo, Vladimir Roddatis, Ainara Aguadero,∗ and John A. Kilner

The grain boundary resistivity problem of highly conductive bulk Li$_{0.34}$La$_{0.55}$TiO$_3$ perovskite has been investigated by means of impedance spectroscopy and solid-state NMR of samples processed in controlled atmospheres. The samples were sintered in air, synthetic air, and oxygen, in which the level of moisture varied. A dry atmosphere is critical to obtain dense ceramics with a low grain boundary resistivity. The grain boundary conductivity is five times higher for samples sintered in oxygen atmosphere due to the suppression of Li$_2$CO$_3$ secondary phase formation, which is responsible for low lithium ion diffusion at the grain boundary.

F. Aguesse, J. M. López del Amo, V. Roddatis,  
A. Aguadero, J. A. Kilner  
CIC EnergiGUNE, Parque Tecnológico de Álava  
Albert Einstein 48, 01510, Míñano, Spain  
E-mail: a.aguadero@imperial.ac.uk
A. Aguadero, J. A. Kilner  
Department of Materials  
Imperial College London  
Exhibition Road, SW7 2AZ, London, UK

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