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**Impact of field stress on electrochemical properties of LLZO**

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Conventional Li-ion batteries use organic solvents as electrolytes, which are known to cause safety issues. Replacing the liquid, organic electrolytes by inorganic, solid electrolytes could eliminate these problems. Furthermore, solid electrolytes enable the use of Li-metal as electrode material, resulting in higher possible energy densities. The garnet-type oxide  $\text{Li}_7\text{La}_3\text{Zr}_2\text{O}_{12}$  (LLZO) has received great attention as a solid electrolyte for all solid-state batteries due to its high Li-ion bulk-conductivity of up to  $10^{-3}$   $\text{S cm}^{-1}$  at room temperature [1]. The application of LLZO, however, requires a deeper understanding of the material in order to achieve high and reproducible Li-ion conductivities.

In this work, we investigated the impact of field-stress on LLZO polycrystalline pellets and single crystals. Voltages of up to a few V were applied using (partly) ion blocking or (partly) reversible electrodes at elevated temperatures in different gas atmospheres (nitrogen and air). The electrochemical processes induced by field-stress were investigated by a combination of impedance spectroscopy and chemical analysis. Local conductivities were determined using circular thin film micro-electrodes prepared by photolithography and ion-beam etching. Laterally resolved elemental compositions of the samples were measured by laser-induced breakdown spectroscopy (LIBS). The correlation between changes in electrical performance and chemical composition is discussed.

Literature:

[1] V. Thangadurai, S. Narayanan, D. Pinzaru, Chem. Soc. Rev. 43, 4714–4727 (2014).