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P3.190 Lithium conducting ceramics for electrochemical sensors in molten metals

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Lithium 6 is the isotope required to generate in-situ tritium in fusion reactors. Because of that, lithium monitoring in lithium-lead eutectic (Pb-15.7Li) is of great importance for the performance of the liquid blanket. Lithium measurements will be required in order to proof tritium self-sufficiency in liquid metal breeding systems. On-line lithium sensors must be designed and tested in order to accomplish these goals.

Solid state electrolytes have been successfully used for gas sensors in many applications. Sensors based on solid state electrolytes have several advantages: generally they are stable compounds which can withstand the harsh chemical environment of the melts, moreover its ionic conductivity increases with the temperature and the output signal (cell potential) is easy to measure.

Lithium conducting electrolytes for molten metals are under development at the Electrochemical Methods Laboratory at Institut Quimic de Sarria (IQS) at Barcelona. Its qualification and performance are being tested. Li-probes for molten metals will be based on the use of ceramic type solid state electrolytes.

In the present work, $\text{Li}_6\text{BaLa}_2\text{Ta}_2\text{O}_{12}$ and $\text{Li}_{6.55}\text{La}_3\text{Zr}_2\text{Ga}_{0.15}\text{O}_{12}$ were synthesized and characterized. The solid state electrolyte was properly shaped in order to be used as a lithium probe. The sensor response was measured electrochemically in different molten lithium alloys.

Presenter: NEL-LO, Marc (Analytical and Applied Chemistry Department ETS Institut Qu'mic de Sarri` Universitat Ramon Llull)

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