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Materials Science Applications of Neutron Depth Profiling at the PGAA facility of Heinz Maier-Leibnitz Zentrum

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Abstract

Neutron depth profiling (NDP) is a non-destructive, isotope-sensitive profiling technique to monitor concentration profiles in almost any material matrix. Since NDP is sensitive to ^{6}Li and lithium is widely used for different material science applications such as ceramics, optical waveguides or energy-storage systems, NDP offers answers to a broad spectrum of research questions. In the present work, the recently developed instrument N4DP at MLZ is used to address two research questions which are hardly accessible by conventional analytical techniques. First, the homogeneity of lithium formations within lithium niobate thin films for optical waveguide applications are investigated. Afterwards, the accumulation of inactive lithium in the solid-electrolyte-interphase (SEI) of silicon-graphite electrodes for lithium-ion batteries is studied *ex situ*. Since the material mass loading differs considerably between the two applications, a new analytical technique is introduced which mathematically separates the different particle signals and thus allows to investigate samples with high mass loadings.

Keywords: Neutron Depth Profiling, Lithium-ion batteries, Thin Film,

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