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The Neutron Depth Profiling Instrument N4DP at the PGAA facility

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Neutron Depth Profiling (NDP) is a non-destructive method to probe concentration profiles of a few light nuclides (mainly Li-6, B-10, N-14) in different host materials. The energy loss of the charged particles produced upon neutron capture of the investigated nuclei is correlated to origin of depth and their signal intensity to concentration amount. Here, depth resolutions down to 5 nm can be achieved, depending on the host material. Applications for NDP are boron implantation profiles in wafers and solar cells, boron distributions in heat-treated superalloys and lithium distributions in OLED prototypes. A main demand for NDP have been coming up lately from lithium-based secondary batteries, where NDP reveals insights into the functionality and aging processes of these devices [1-4]. The here presented N4DP setup is situated at the PGAA facility of MLZ, which provides ideal conditions for NDP: a cold neutron flux up to 5E10 s-1cm-2, while maintaining a low background signal. Furthermore, both techniques complement each other, since NDP provides depth distributions of single nuclides within the material, whereas PGAA probes the bulk material composition.

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