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In-situ investigation of deformation mechanisms in a textured magnesium alloy AZ31

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A combination of mutually complementary *in-situ* experimental techniques was employed to study the influence of texture on the activity of individual deformation mechanisms during deformation of the magnesium alloy AZ31. Sets of samples with three different orientations with respect to the detected basal texture of the rolled sheet of a commercial AZ31 alloy were machined – normal direction (ND), rolling direction (RD) and 45° between RD and ND (45). Neutron diffraction spectra of the compressed samples were collected in pre-selected stages of deformation, coupled with a simultaneous recording of the acoustic emission signal. Further analysis was carried out based on electron backscattered diffraction (EBSD) patterns obtained during the *in-situ* deformation tests inside the specimen chamber of a scanning electron microscope. A high-speed camera imaging of sample surface during deformation provided information about the plastic inhomogeneities and yielded datasets for the digital image correlation (DIC) analysis of strain localization. The evolution of the texture-dictated activity of individual deformation mechanisms (namely the $\{10\bar{1}2\}$ extension twinning) was surveyed with the selected experimental techniques and was linked to the mechanical performance of the deformed material.

Keywords: Magnesium, deformation, texture, twinning, in-situ

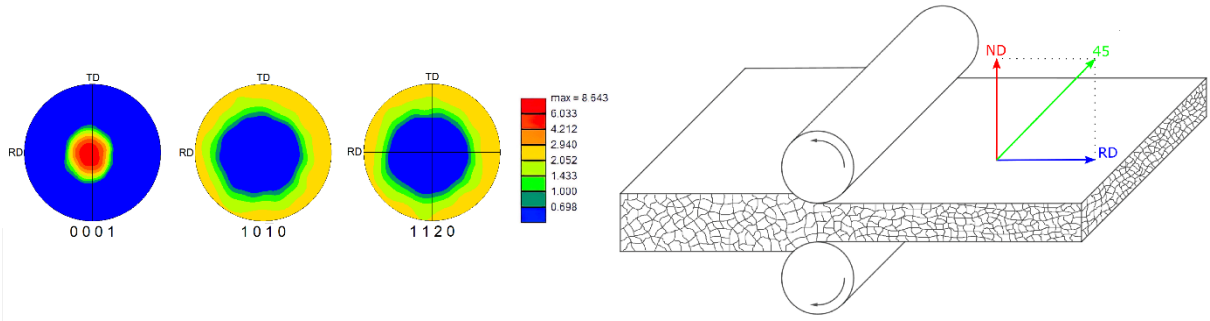

Figure 1: Basal texture of the rolled sheet and selected sample orientations