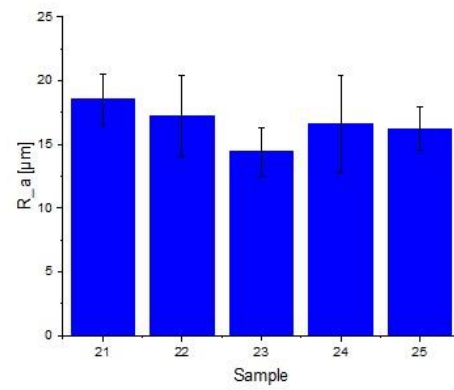
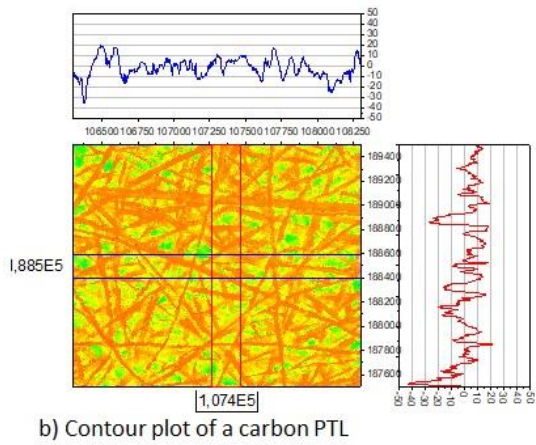
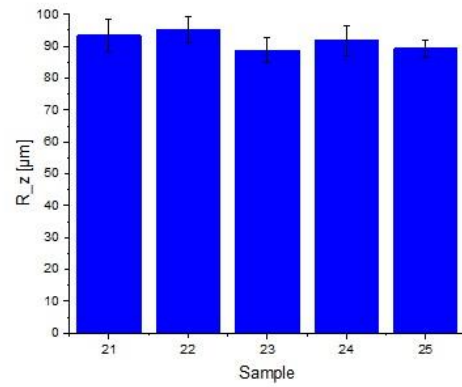
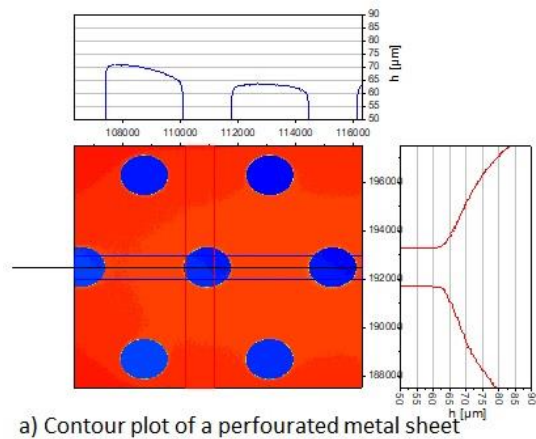


Statistical investigation of the reproducibility of stack components in a PEM water electrolyzer

To achieve homogeneous conditions throughout a single cell of a stack and within a stack and furthermore within several stacks, the components assembled in a stack should be reproducible to achieve a homogeneous performance. To evaluate how reproducible the stack components are, the porous transport layers, the expanded metals sheets, the perforated metal sheets, and the flow field plates from a 5-cell stack were examined.

Eight samples were cut out of each of the 450 cm² layers, and a height profile (area: 10 x 10 mm) was recorded using a laser scan. From the height profile, the roughness values R_a (arithmetic average) and R_z (maximum peak to valley height) could be derived as well as the curvature of the samples (see Figure 1). Figure 1a) shows a contour plot of a perforated metal sheet. There is a height difference of up to 20 µm from the edge to the center of the sample. For the stack assembly this means an initial force is required to flatten the sheet before the actual compression of the stack takes place. Figure 1b) shows the roughness values R_a and R_z . The values vary within the sample (R_a : ± 3.8 µm, R_z : ± 5.7 µm) and throughout the samples (R_a : ± 1.4 µm, R_z : ± 2.5 µm). Further, the thickness of the components was measured, and the variation was calculated. In terms of stacking the components, as done in the stack, the best and worst case were calculated. The aim of this study was to determine input parameters for follow-up tests for the mechanical and electrical characterization of the components as especially the roughness of the components may have a significant impact on the contact resistance.



c) Roughness values of a PTL