FAST XRPD MEASUREMENT OF POWDERS BY USING IMAGE-PLATE AND ROTATING ANODE SOURCE - COMPARISON WITH CONVENTIONAL BRAGG-BRENTANO DIFFRACTOMETER

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Image-plate detector performs simultaneous charge accumulation providing fast data collection. A high resolution Guinier image-plate camera was installed on a rotating anode source. This configuration enables fast measurement with high resolution. There are some differences between the Guinier image-plate camera (GIP) and the conventional Bragg-Brentano diffractometer (BBD). The GIP works in transmission mode with constant focusing circle. The monochromator attached to the source providing $K\alpha_1$ radiation. There is no background cut. The range of the scattering angles 2θ is between 1 to 100°. The BBD works in back reflection mode with multiple focusing circles. The monochromator attached to the detector, cuts $K\beta$ and most of the background but without diminishing of $K\alpha_2$. The range of the scattering angles 2θ is between 0.5 to 158°. In the standard measurement procedures there are also differences in the sample loading and measurement. In GIP a thin layer of powder is loaded and the illuminated area and depth is equal for the entire 2θ range. In BBD the sample is loaded in a cavity and the illuminated area and depth are changing along 2θ range. As a final point, the counting principles in GIP and BBD are totally different.

Due to the major differences in geometry, radiation, sample loading, and counting method, it was decided to present a comparison between the results which were obtained after analyzing GIP and BBD measured data.

Most of the samples were high quality powders of well known solids like LaB_6, ZnO, α Al_2O_3, CeO_2, NIST standards, WC. More complicated structures were studied such as monoclinic HfO_2 and ZrO_2. The crystal structure characteristics including cell parameters and atomic positions were compared. In addition, quantitative analysis was performed by XRPD measured by GIP and BBD for mixtures of corundum and zirconia, in order to compare the results of relative phase amounts in both systems.

The main tool for the data processing was the whole-pattern fitting (Rietveld method).