

Computed Tomography Experiments on a Laboratory Multipurpose Diffractometer

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Performing Computed Tomography (CT) on a laboratory multipurpose diffractometer offers the possibility for an easy correlation between microstructure information and traditional XRD analysis (Powder XRD, Stress & Texture, μ -XRD etc.). A more complete picture of the sample is obtained when phase or stress analysis results can be correlated with macroscopic material properties or different sample parameters, such as porosity, orientation of certain components, distribution of the materials, size of inclusions, wall thickness or other features of the analyzed objects.

Recent improvements in the instrumental set-up allow to use standard powder diffraction tubes for CT while achieving the resolution of a cone beam CT set-up with traditional micro source. The improved resolution reveals more details on the analyzed objects and allows to perform a more thorough and efficient non-destructive testing.

Applications of soft (Co and Cu X-ray tube) and hard (Mo and Ag X-ray tube) radiation in computed tomography experiments are presented. Using low energy (<10 keV) X-ray sources provide the possibility to investigate objects made of light (organic) materials in more detail compared to the high energy application. In case of metal or heavy element containing composites high energy (~20 keV) X-ray sources allow to obtain full 3D information on the samples without destroying them. These measurements facilitate both qualitative and quantitative analysis of porous materials, samples with oriented components, and distribution of solid compounds.