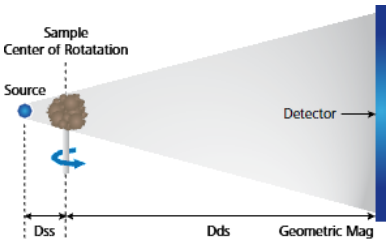
INSTRUMENT DATABASE

Non-destructive 3D imaging and testing of materials

|| X-ray computed tomography (X-CT)

3 D X-ray micro-computed tomography (micro-CT) provides non-destructive access to the internal microstructure and composition of materials under a variety of conditions and environments.

The sample, situated between x-ray source and detector, sequentially rotates in steps of less than 1°. During a full 360° rotation up to several hundred projection images are taking. After a numerical back projections of the images, the volumetric data can be visualized and analysed using software tools such as Volume Graphics that provide access to any desired 3D view or 2D cross section of the sample. The magnification using conventional CTs depends on the source-sample-detector distance (Fig. 1).



Using X-CT it is possible to non-destructively:

- investigate microstructural properties at multiple length scales,
- characterize and quantify pore structures and inclusions,
- investigate grain and fibre orientation,
- characterize and observe fracture mechanics,
- visualize biologic structures including cellular and subcellular features,
- investigate historic artefacts,

a) b) c)

Fig. 2: a) X-ray image of a compression- and impact-loaded pin-reinforced sandwich structure; b) 3D view of bi-component fibers (Ø ca. 200 µm); c) short fibre injection moulded T-bracket, 3D view and color-coded pore analysis.

|| X-ray computed tomography: Phoenix-xray v|tome|x m

01 || General Information

Keywords: X-ray computed tomography, tomography, non-destructive testing, in situ, X-CT, NDT

Categories: Material Properties, Dimensional Properties, Surface / Interface Characterization

Main Application: 3D material characterisation, in-situ experiments and non-destructive testing of metals, compound materials and opto-electronic components

Measured Quantities: 3D-shape, defects, interfaces, volume

Year of Fabrication: 2014, funded by Wirtschaftsförderung Bremen WFB (QS1001)

Manufacturer: General electric (GE); Phoenix-xray v|tome|x m; research edition

02 II Specifications

- 180 kV / 15 W nano-focus x-ray tub
  Detail Detectability: down to 1 µm (object size 2 mm)
- 240 kV / 320 W micro-focus x-ray tube (up to 40 mm steel)
  Detail Detectability: down to 3 µm
- Max. Object Size (height x diameter) 600 mm x 500 mm;
- Max. Object Weight 50 kg

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