Thinking the Future
Zukunft denken

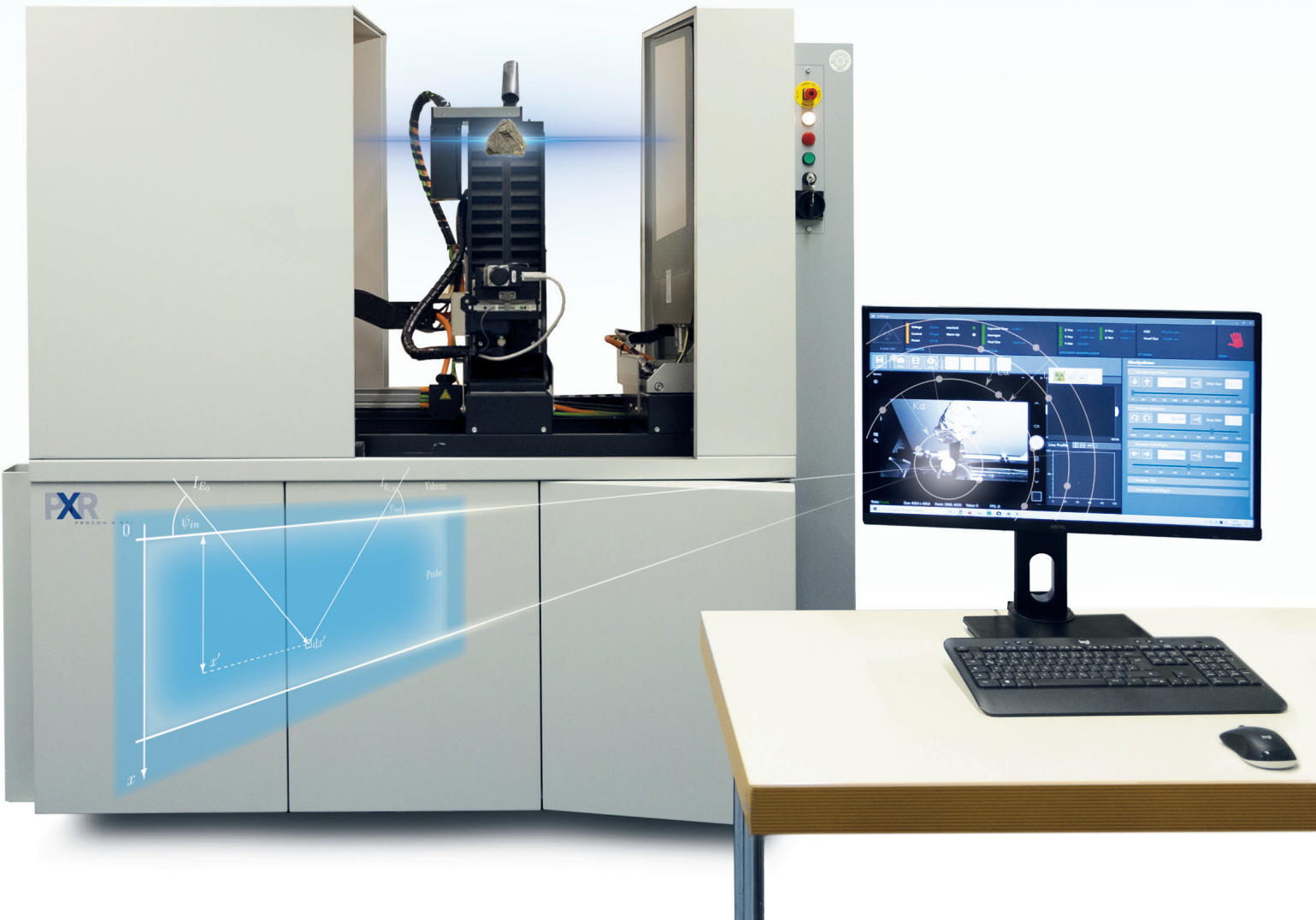
Institute of Mineral Resources Engineering

RWTH AACHEN UNIVERSITY

Research

Industrial Computed Tomography

Deep Insight Applications



knowledge
to resource the future

MRE Institute of Mineral Resources Engineering | RWTH AACHEN UNIVERSITY

Abstract

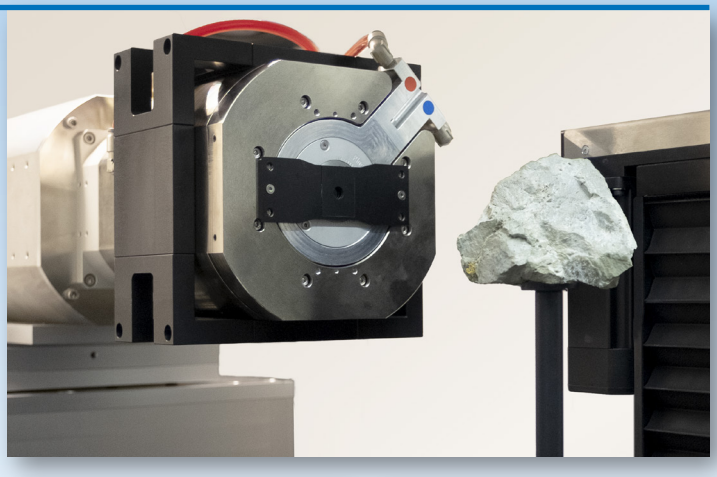
Computed Tomography (CT) is a non-destructive X-ray computerized method for studying the microstructure of multi-component materials and constructions in a 3D regime. It is currently the only method that allows the observation and analysis of internal and external microstructures of sample objects, both organic and inorganic, with no sample preparation requirements (such as sectioning and grinding) and without strong limitations on the size and shape of the objects studied (compared to other high-resolution imaging techniques). CT can be used to detect the internal design of different components of a sample object – such as grain sizes, inclusions, distortions, inhomogeneity, and defects (porosity, cracks) – supported by the digital reconstruction of the 3D images. Since January 2020, a newly established CT laboratory is operational at the Institute of Mineral Resources Engineering (MRE), RWTH Aachen University. The acquired CT-scanner „ProCon CT-Alpha" is designed to meet the requirements from various fields of research, including the geological, biological and archaeological sciences and engineering disciplines. It can be used to establish the micro-structure of ores, rocks, fossils, concrete and construction materials and applied to material and damage analysis of manufactured goods including plastics, wood-based materials, building materials, metals and composite hybrid materials.

Application fields

CT has an almost unlimited range of applications, because X-ray radiation can be applied independently of the sample material. The CT scanner at the MRE has a high level of flexibility due to its large measuring cabinet, strong X-ray tube, reaching 240 kV, and large panel detector. Large samples with a diameter of up to 600 mm can be analysed and resolutions down to 5 microns are possible.

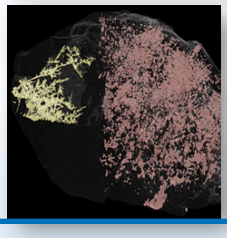
Therefore, the following materials can be studied:

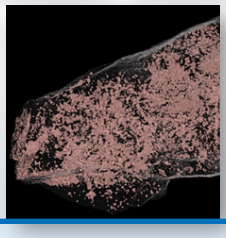
- Minerals, ores, rocks, coal, fossils, bones and archaeological matters
- Concrete and asphalt construction materials
- Polymers, fiber composites and ceramics, including Li-ion batteries
- Light and heavy metal parts, including additive manufactured products and 3D-printed parts

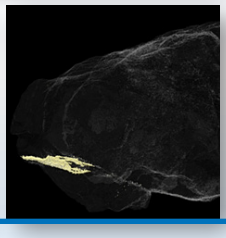


Equipment

1. X-ray tube of model „XWT-240-TCHE Plus", reaching maximum 240 kV,
2. Detector system XRD 1611 AP3, having 4064 x 4064 Pixel, each pixel is 100 µm
3. 5-Axis System X-Y-Z-Rotation-Tilting for fine positioning
4. Different W-targets for high resolution and performance regimes
5. Software VG Studio MAX 3.3 for 3D-reconstruction and 3D-visualisation
6. Sample size: max. 60 cm (greatest extension)
7. Specimen weight: max. 15 kg
8. 3D-printer for manufacturing of high-precision sample holders







Publications

Gainov RR, Lottermoser BG, Kolobov S, Szabo G. Computed tomography of gold ore from the Porgera mine, Papua New Guinea: implications for acid rock drainage prediction. Book of Abstracts of the 10th Conference on Industrial Computed Tomography, Wels, Austria (iCT 2020), pp.215-216.

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Gainov RR, Faidel D, Behr W, Natour G, Pauly F, Vagizov FG, Fuchs H, Hantschke L, Albrecht S 316L steel SLM-manufactured ion-flow-tubes with variable porosity investigated by Computed Tomography and Gas flowmetry, 2020, Submitted

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