

Non-ambient X-ray diffraction – a further dimension in crystallography

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About 100 years ago, one of the first non-ambient studies was done on resistively heated wires to observe property changes with regard to the transition from α - to β -iron [1] using X-ray diffraction (XRD). At this time, the first ever high-temperature camera was developed for this purpose. This milestone opened the fascinating discipline of non-ambient XRD and since then the changing physical, chemical and mechanical material properties from standard to non-ambient conditions could be studied in-situ.

When exposing sample materials to non-ambient conditions, their properties (chemical, physical,...) may significantly change, frequently leading to a completely different behavior of the material. Due to this, intensive studies have to be performed in order to obtain material properties over the complete range of possible non-ambient conditions.

Non-ambient X-ray diffraction is a versatile tool to study processes linked to variable non-ambient conditions (temperature, pressure, gas environments, relative humidity, electrical and magnetic fields, mechanical load,...). Besides its relevance for conducting research, this knowledge is essential for optimizing technical processes and performing quality control in industry.

Anton Paar is the market leader in non-ambient XRD instrumentation and is continuously striving to optimize the design and set-up of commercially available non-ambient XRD stages. This poster will highlight the possibilities of setting up non-ambient XRD experiments, how to enhance the data quality of your experiment, and what needs to be considered when performing a non-ambient XRD experiment.

[1] Westgren, A., Lindh, A. E. (1921). I. Z. Phys. Chem. 98, 181.

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