From Ambient to Operando: New Developments in XRD and Non-Ambient XRD at Anton Paar

B. Puhr[1] and B. Völker[1]

[1] Anton Paar GmbH, Graz, Austria

Anton Paar has a long-standing history in X-ray analysis, beginning with the development of the first commercial Kratky small angle X-ray scattering (SAXS) camera in the 1950s and continuing today with a broad portfolio of X-ray diffraction (XRD), SAXS, and non-ambient XRD solutions. By combining developments in X-ray sources, optics, automation, and sample environment technologies, Anton Paar provides versatile instrumentation solutions for modern material characterization.

This presentation highlights the latest advancements in laboratory powder XRD instrumentation from Anton Paar, focusing on XRDynamic 500, the new XRDynamic Autosampler, and next-generation non-ambient XRD solutions. Key developments include automated beam geometry switching, self-alignment routines, evacuated beam paths, and high-resolution optics, providing outstanding data quality, low background, and maximum experimental flexibility. The newly introduced autosampler further enhances laboratory efficiency by enabling automated high-throughput measurements of up to 105 samples with minimal user intervention.

Special emphasis is placed on Anton Paar's leadership in non-ambient XRD, including the HTK 1500 High-Temperature Chamber environmental heater and integrated in situ/operando capabilities for studies under controlled temperature, gas atmosphere, humidity, pressure, and electrical load conditions. Application examples from batteries, catalysts, pharmaceuticals, ceramics, metals, and functional materials demonstrate how Anton Paar combines precision engineering, automation, and ease of use to drive the future of diffraction-based materials research.