

SMALL- AND WIDE-ANGLE X-RAY SCATTERING IN PHARMACEUTICAL RESEARCH AND INDUSTRIAL PRACTICE

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Small- and wide-angle X-ray scattering (SWAX) is among the most versatile and informative methods for the structural characterization of materials at the nanoscale. Instrumentation development supported by new technologies, including advanced X-ray optics, fast position sensitive detectors, automatization and pattern recognition, has transformed SWAX from a complicated method for specialists into a rapid and user-friendly tool. Today it stands alongside other standard spectroscopic or thermodynamic methods in the industrial, analytical laboratory. Typical applications include:

- Mesophase structure and phase diagram of heterogeneous formulations
- Inner surface / nanoporosity in crystalline-amorphous systems
- Real-time, *in-situ* tests of polymer coat leaching
- Thermal phase transitions
- Biomembrane activity tests, e.g. of antibiotics or anaesthetics
- Liposome structure and stability

The underlying principles and specific examples for each type of application will be presented.

The small-angle X-ray technique has also recently been developed into a method for real-time, on-line product monitoring in large-scale chemical production, specifically of liquid crystalline slurries. First prototype tests in a production plant for concentrated liquid detergents have demonstrated the high potential of this method for transforming a batch production into a continuous process by using the SAX signal as a control lead for constant product adjustment.

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