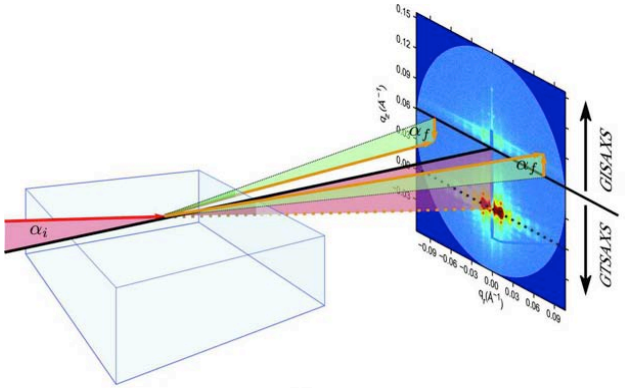
X-Ray Scattering Technique Pushes Imaging to the Edge

Scientific Achievement

Developed new technique called Grazing-Transmission Small Angle X-ray Scattering (GTSAXS) that shifts nanoscale samples to the edge of a substrate, allowing X-rays to pass through cleanly and emerge with less distortion and superior image robustness



GTSAXS and GISAXS geometries: The incident beam (red arrow) impinges on the sample and then scatters, and the direct incoming beam (orange dotted line) goes through the origin of the q_r-q_z reciprocal space. In the scattering image, the solid line marks the surface horizon and divides the GTSAXS and GISAXS regimes.

Significance and Impact

Undistorted scattering improves imaging of any nanostructure on a flat substrate—nanocatalysts, self-assembled polymers, lithographic patterns, and any complex thin films. GTSAXS also allows real-time studies of nanoscale changes and reactions.

Research Details

- Monochromatic X-rays from beamline X9 at the National Synchrotron Light Source was focused onto the edge of a nanostructured thin film; appropriate analysis enables recovery of undistorted scattering pattern
- Allows for fast scattering measurements that avoid the refraction and reflection effects that have plagued grazing-incidence X-ray scattering
- GTSAXS makes it possible to record scattering images that are well described by straightforward (Born approximation) scattering models

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