Ultra-small-angle X-ray scattering—X-ray photon correlation spectroscopy: A New measurement technique for in-situ Studies of equilibrium and nonequilibrium dynamics

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Ultra-small-angle X-ray scattering—X-ray photon correlation spectroscopy (USAXS-XPCS) is a measurement technique for the study of equilibrium and slow nonequilibrium dynamics in disordered materials. Taking advantage of Bonse-Hart crystal optics, this technique fills a gap between the accessible scattering vector ranges of dynamic light scattering and conventional X-ray photon correlation spectroscopy. It also overcomes the limits of visible light scattering techniques imposed by multiple scattering and is suitable for the study of optically opaque materials containing near-micrometer sized structures.

USAXS-XPCS has been applied to study the equilibrium dynamics of micrometer-sized colloidal dispersions and nonequilibrium dynamics of polymer composites and alloy steels. We anticipate that this technique will be important in the understanding of thermally-induced equilibrium dynamics of soft materials and nonequilibrium behavior of both soft and hard materials, and lead to technical payoffs in a wide range of areas such as the manufacture of advanced ceramic and metallurgical materials and self-repairing biologically critical materials.


Keywords: ultra-small-angle X-ray scattering, X-ray photon correlation spectroscopy, dynamics.

RDF studies on microstructural changes in coir fibre by the action of enzymes

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This work reports radial distribution functional (RDF) analysis of x-ray intensities diffracted from coir fibres (lingo-cellulose in nature) obtained from Kerala, India and that of the same coir fibres treated with enzyme laccase and xylanase (to do away with lignin, hemicellulose, pectin and waxy materials) and consequently changes in inter-atomic distances, coupling constants [1] and mean square displacements [2] from the position and breadth of the every peak in RDF pattern were calculated. Although inter-atomic distances do not change significantly, the coupling constant and mean square displacement changes considerably suggesting improvement in mechanical properties of the enzyme treated coir fibres. This was further corroborated by the measurement of tensile strain of treated and untreated fibres.


Keywords: database, open-access, CIF