Abstract Submitted
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Application of ultra-small-angle X-ray scattering / X-ray photon correlation spectroscopy to relate equilibrium or non-equilibrium dynamics to microstructure[1] ANDREW ALLEN, FAN ZHANG, LYLE LEVINE, NIST, JAN ILAVSKY, Argonne National Laboratory — Ultra-small-angle X-ray scattering (USAXS) can probe microstructures over the nanometer-to-micrometer scale range. Through use of a small instrument entrance slit, X-ray photon correlation spectroscopy (XPCS) exploits the partial coherence of an X-ray synchrotron undulator beam to provide unprecedented sensitivity to the dynamics of microstructural change. In USAXS/XPCS studies, the dynamics of local structures in a scale range of 100 nm to 1000 nm can be related to an overall hierarchical microstructure extending from 1 nm to more than 1000 nm. Using a point-detection scintillator mode, the equilibrium dynamics at ambient temperature of small particles (which move more slowly than nanoparticles) in aqueous suspension have been quantified directly for the first time. Using a USAXS-XPCS scanning mode for non-equilibrium dynamics incipient processes within dental composites have been elucidated, prior to effects becoming detectable using any other technique.

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