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Algorithm-Accelerated Six-Dimensional WAXD Tensor Tomography

Wednesday 28 August 2024 17:15 (15 minutes)

We propose a novel 6D X-ray wide-angle diffraction (WAXD) tensor tomography method which only requires a conventional 3D scanning tomography acquisition protocol. The new method can increase the acquisition efficiency of the 6D WAXD tensor tomography by at least one order of magnitude by fully exploring the hidden 3D reciprocal information in the 2D WAXD pattern.
X-ray scattering/diffraction tensor tomography techniques are promising methods that can acquire the 3D texture information of heterogeneous biological tissues at micrometer resolution. However, the methods suffer from a long overall acquisition time due to the multi-dimensional scanning across the real and reciprocal space. Here we introduce a new approach to obtain 3D reciprocal information of each illuminated scanning volume using mathematical modeling, which is equivalent to a physical scanning procedure for collecting full reciprocal information required for the voxel reconstruction. The virtual reciprocal scanning scheme was validated by a simulated 6D WAXD tomography experiment. The theoretical validation of our method represents an important technological advancement for the 6D diffraction tensor tomography and a crucial step toward pervasive applications in the characterization of heterogeneous materials.

I plan to submit also conference proceedings

No

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