W0321

Diffraction from a Laser-aligned Beam of Hydrated Proteins. John C H Spence, Dept. of Physics, Arizona State Univ., Tempe, AZ 85282.

Apparatus is under construction at ASU physics (electrons) and at the Advanced Light Source in Berkeley (X-rays) to obtain diffraction patterns from a single-file submicron liquid droplet stream. Each water droplet contains, on average, one protein. The droplets freeze by evaporative cooling to vitreous ice. The molecules are aligned by a 100 watt CW fiber laser. All three beams, laser, X-rays and droplets, run continuously, and diffraction data is aquired continuously until adequate signal-to-noise is achieved. The laser polarization is then rotated into a new orientation using a quarter-wave plate, allowing tomographic diffraction data collection for three-dimensional reconstruction. The phase problem is solved by iterative Gerchberg-Saxton-Fienup methods. The requirements of laser power and droplet temperature needed to achieve sub-nanometer resolution and so observe the secondary structure of proteins will be described in detail.

This work is a collaboration including B. Doak, H. Chapman, U. Weierstall, K. Schmidt, D. Starodub, M. Howells, D. Shapiro and G. Hembree, funded by NSF and CBST. The work is described in PRL 98, 198102 (2004) and in Acta Cryst A (2005) In press.