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Dynamic effects in alignment of biological macromolecules for diffraction experiments.[1] D. STARODUB, U. WEIERSTALL, K. SCHMIDT, R. B. DOAK, P. FROMME, J. C. H. SPENCE — Molecular alignment by means of anisotropic polarizability interaction with a laser electric field is the crucial step in the recently proposed serial diffraction of non-crystallizable proteins, where protein damage is prevented by recording the x-ray diffraction pattern from an array of identically oriented proteins passing through the intersection of x-ray and laser beams. The proteins can be delivered using a periodically triggered Rayleigh beam of doped water droplets. The behavior of a small globular protein (lysozyme), a large protein complex (ribosome) and a rodlike virus (TMV) in a water droplet and a gas damping cell at various pressures is considered. Optimum conditions for alignment in terms of laser power, pressure in a damping cell and adiabatic field switch-on are discussed. The degree of molecular alignment depends on these conditions and has to be sufficient to obtain sub-nanometer resolution in the charge density maps recovered from diffraction patterns.

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