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Photon correlation measurements using a MHz repetition rate X-ray free-electron laser

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I will present recent advances in X-Ray Photon Correlation Spectroscopy (XPCS) at the MID instrument of the European XFEL. Access to sub-ms timescales is important for studying diffusion-type dynamics in aqueous solutions, for instance of colloids and bio-molecules. The European XFEL with its MHz repetition rate, provides this opportunity. XFEL experiments often require specialized sample replenishing and sample environments, for instance liquid jet delivery or fast scanning methods. The short-pulse duration and high peak brilliance of the source also gives unique possibilities for investigating the initial states of crystallization, for instance in a super-cooled liquid. X-ray Cross-Correlation Analysis (XCCA) yields direct access to studying the crystalline order and emerging defects, beyond classical crystallography experiments.

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