100-picosecond Time-resolved X-ray Absorption Fine Structure of Fe^{II}(1,10-phenanthroline)$_3$

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Studying photo-induced molecular dynamics in liquid with subnanosecond time-resolution gives information for understanding fundamental chemistry, biology and also for developing new materials and devices. Monitoring the dynamic phenomenon requires a sensitive tools to investigate the electronic state and the structure with atomic resolution[1,2]. Previously, we have reported the success in measuring the photodissociation of ligands in NiTPP system in solution[3]. Here, we have performed time-resolved X-ray absorption fine structure on the spin-crossover complex Fe^{II} tris-(1,10-phenanthroline) dissolved in aqueous solution. In this system, excitation by femtosecond laser pulse of 400nm induces the spin state transition from low spin to high spin one as a result of the photo-induced expansion in the Fe-N bond length similar to other spin crossover systems[4]. All measurements were performed in fluorescence method at the iron K-edge on the undulator beamline NW14A at the Photon Factory Advanced Ring[3]. Obtained results clearly demonstrate the success in probing both structural and spin state changes induced by 400nm femtosecond laser pulse excitation with 100ps resolution by this method.

Reference

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