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Tracking the ultrafast dynamics of photoinduced spin-state switching in metallogrid complexes

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Photoinduced spin-switching in molecular complexes containing d4-d6 transition metal ions is an important phenomenon that enables numerous applications in chemistry, biology and nanotechnology. At the microscopic level, this process originates from the bistability between a low-spin (LS) and a high-spin (HS) state, which can be activated through light irradiation. Although the vast majority of the building blocks tend to be mononuclear complexes, unique electronic and magnetic properties emerge when the nuclearity of the complexes increases from monomeric to oligomeric. Fundamental diagnostics about the photo-switching event in a polynuclear assembly are embedded, not only in the spin transition rate, but also in the structural rearrangements that result from photoexcitation. Although these multi-scale dynamics are essential for understanding the spin-switching, they remain ill-characterized for large systems due to their strong coupling.
This talk will present time-resolved X-ray measurements performed on a family of pyrazolate-based [2x2] FeII grid complexes, both on the picosecond and on the femtosecond time scales. The direct monitoring of the ultrafast dynamics with atomic and spin sensitivity reveals the intrinsic nature of their switching mechanism.

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