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A possible mechanism for X-ray induced photoreduction

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Oxidation state changes of metal organic complexes play an important role in many chemical and biological processes. X-ray absorption near edge spectroscopy (XANES) is a powerful tool to follow these changes since it can directly probe the oxidation state of a metal center[1]. However, X-rays themselves are known to cause photoreduction in photosensitive samples[2, 3,]. In order to reduce X-ray induced photoreduction, t is important to gain a deeper understanding of this process. XANES was used to investigate the influence of temperature, solvent content and chemical composition on three model systems.
Based on our results, we could propose a model for X-ray induced photoreduction of metal organic complexes: A low energy electron[4] generated upon X-ray irradiation attaches to the metal center, yielding a short-lived excited state. Photoreduction of the metal center becomes permanent by an oxidation in the ligand, accompanied by the release of a leaving group and an electron. A possible temperature dependence can be explained by the temperature dependence of the oxidation reaction.

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