Transition metal L-edge spectroscopy on biological and related systems enabled by LCLS-II

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Transition metals play a crucial role in the active site of many important enzyme systems. To fully understand the factors contributing to the high efficiency and specificity often encountered in these systems, a detailed understanding of the changes in electronic structure (especially the valence orbitals) of the metal centers during the course of the catalytic cycle is crucial in addition to structural knowledge. I will describe initial experiments at LCLS to obtain such information using L-edge spectroscopy and will describe the possible experiments at LCLS-II, especially at the new NEH 2.2 instrument, to study not only the steady state electronic structure of metal centers in biological systems and related models but also how time-resolved spectroscopy under physiological conditions will help to follow the reaction pathways in these systems. I will also discuss how the combination of future hard X-ray and soft X-ray studies at LCLS-II can be beneficial to a better understanding of such systems.