Photoactive Complexes with Earth-Abundant d⁶-Metals

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Precious and rare elements such Ru and Ir are used in some of the most popular photoactive complexes, but interest in alternatives made from earth-abundant metals is growing. Fe and Cu have long received significant attention and recent breakthroughs are very encouraging. Nevertheless, it seems worthwhile to explore other abundant first- and second-row transition metals for usage in photoactive complexes. Our group discovered that chelating isocyanide ligands provide access to luminescent Cr and Mo complexes that are isoelectronic to Fe(bpy)₃²⁺ and Ru(bpy)₃²⁺, and we demonstrated that they can be used for triplet fusion and photoredox catalysis.

This talk will begin with an introduction to the basic challenges faced when aiming at emissive 3d⁶ complexes. New results from our research on complexes with Cr, Mo and other earth-abundant metals will be presented. Particular focus will be on ligand design, excited-state relaxation pathways, luminescence color tuning, the interplay between singlet and triplet emission, and photoredox properties.

Fig 1. Cr and Mo complexes with chelating isocyanide ligands.