Kinetic analysis of the mechanosyntheses of transition metal complexes and precursors

Erin E. O’Donnell, Rachel J. Allenbaugh, Murray State University

Mechanosynthesis, where reactants are ground together to induce reaction, is emerging as an alternative to solution-based, thermally induced methods for producing a wide variety of products and materials. Often accomplished through ball milling, these reactions use little to no solvent and give more sustainable compound preparation through (1) reduced solvent use, (2) reduced reaction time, and (3) reduced waste. The kinetics of the mechanosyntheses of a variety of zinc and palladium dialkyl-2,2′-bipyridyl-4,4′-dicarboxylate complexes will be presented. By fitting the reaction data to a variety of different models and determining how kinetic parameters vary with differences in ligand functionalization and metal salt, guidelines for more efficient preparations of transition metal complexes can be determined. Conclusions on maximizing sustainability in these preparations will be shared.