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One of the most important environmental issues today is finding ways to reduce the amount of carbon dioxide that humans produce and release into the atmosphere. A possible solution to this problem is to find an efficient way to convert captured carbon dioxide to other compounds; however, carbon dioxide is not a very reactive molecule, so it is difficult to produce conditions under which these reactions are possible. Therefore, our lab has worked to develop transition metal catalysts that make the reduction of carbon dioxide more accessible.

Previously, our lab has used variants of the N4 ligand system to stabilize various oxidation states of different transition metals, especially nickel and palladium, and has investigated the catalytic properties of the resulting metal complexes. After developing the N4PicTs ligand, we have characterized the complexes of this ligand with Mn^{II}, Fe^{II}, Co^{II}, Ni^{II}, Cu^{II}, Zn^{II}, and Pd^{II} in terms of both their structural and chemical properties. Additionally, we have used electrochemical techniques to analyze their potential to serve as catalysts for carbon dioxide reduction. So far, the Fe^{II}, Co^{II}, Ni^{II}, Cu^{II} complexes show some potential for this type of chemistry. Our goal is to further study these reactions in order to optimize them and determine their efficiency.