

Nitrogen Fixation using Low-Coordinate Iron Complexes

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Iron plays a central role in the two major processes that convert nitrogen in the atmosphere to fertilizers needed for the food on our plates. The enzyme nitrogenase uses an iron-sulfur cluster, while the Haber-Bosch process uses a solid iron catalyst. Despite intense research, the catalytic mechanisms are not understood at an atomic level of detail for either catalyst, and this motivates the study of well-defined iron complexes and how they interact with N_2 . I will discuss our synthesis of low-coordinate iron coordination compounds, which have led to new insights into both N_2 binding and cleaving processes. These have included the first iron complexes with in which the nitrogen-nitrogen bond of N_2 is broken, as well as biomimetic Fe- N_2 complexes. These new research results help chemists to understand elementary steps in the conversion of N_2 to ammonia, and the talk will highlight parallels between solution, enzyme, and surface chemistry.