

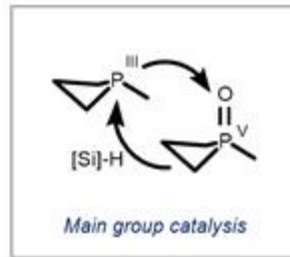
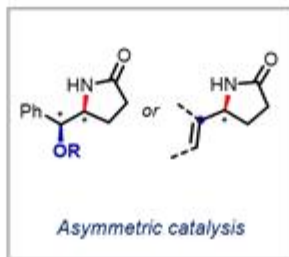
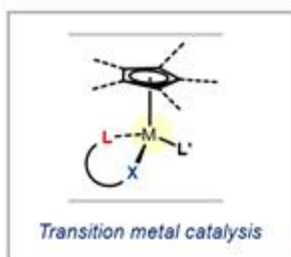
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Navigating the Periodic Table for Catalysis: From Transition Metal to Main Group Elements

Catalytic reactions that construct carbon-nitrogen (C–N) bonds are of sustained interest in the synthetic organic community since they can offer a streamlined route to useful nitrogen-containing motifs commonly encountered in natural products and clinical drugs.¹ The prevailing strategy to meet such demands in industrial settings is currently shaped by transition metal-catalyzed methods, as exemplified by Buchwald-Hartwig aminations. Despite the significant strides in this area, increasing emphasis has been placed on developing a cost-effective and sustainable alternative that omits a transition metal and repositions the main group elements from the catalytic periphery to the center of bond making and breaking during catalysis.

In this talk, I will first describe research efforts aimed at inventing new transition-metal catalysts, enabling mild and efficient C–N bond-forming reactions via the metal-nitrenoid transfer pathway.^{2–4} This mechanistic framework ushered in the further development of chiral variants, revealing new opportunities in asymmetric synthesis. Second, a functionally and mechanistically distinct main group-catalyzed method will be presented.⁵ By accentuating the biphilic reactivity of phosphacycles, we are able to use nitroalkanes—many of which are stable and inexpensive—as primary aminating reagents for C–N coupling chemistry. This method represents a sustainable way of preparing nitrogen-containing products that not only shows complementarity in scope and selectivity to existing methods but bypasses commonly faced challenges (e.g. overamination and metal contamination) in transition metal catalysis.



References

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