Exploring the Frontiers of Low-Valent Carbon: Isolable Carbyne Anions and Carbenes with Inverted Electronic Configurations

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Phosphino groups serve as versatile π-donor substituents, playing a pivotal role in stabilizing various unusual main group species. In our recent research, we explored the chemistry of phosphinodiazomethylide salts grounded in bulky diazaphospholidine frameworks, yielding several remarkable results: 1) We isolated (auro)(phosphino)carbenes, representing one of the isomeric forms of well-established transition metal carbyne complexes;[1] 2) We achieved the isolation of copper carbyne anion complexes, marking the first-ever instance of a carbyne anion complex in the condensed phase;[2] 3) We isolated a ketenyl anion, providing a powerful synthon for the generation of unconventional anions;[3] 4) We isolated a free stannyne, an unprecedented main group species featuring diverse adjacent ambiphilic main group centers;[4] and 6) We isolated a stable carbene with an inverted electronic configuration.[5] These findings offer valuable insights into the potential of phosphino groups for the stabilization of unique chemical species and open up new avenues for exploration in the field of main group chemistry.

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