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*“Reactive Phosphorus Intermediates Generated from Anthracene-Based  
Molecular Precursors”*

We are interested in the properties of small molecules that are too reactive to be stored in a bottle. In order to access their chemistry, we design and synthesize molecular precursors that can be activated by a stimulus to release a small molecule of interest. The molecular precursors themselves are isolated as crystalline solids, they are typically soluble in common organic solvents, and they can be weighed out and used as needed. For example, the molecule  $P_2A_2$  (A = anthracene or  $C_{14}H_{10}$ ) is a molecular precursor to the reactive diatomic molecule  $P_2$ . Heating a solution containing  $P_2A_2$  in the presence of a  $P_2$  acceptor (examples include organic 1,3-diene molecules, the azide ion) results in loss of 2 A and transfer of the  $P_2$  unit to the acceptor. We also show that heating a solid sample of  $P_2A_2$  leads to evolution of  $P_2$  into the gas phase. In choosing our targets we take inspiration from interstellar chemistry; other reactive intermediates to be discussed include HCP and  $R_2N-P$ , aminophosphinidenes. Aminophosphinidene transfer to olefins, a reaction analogous to aziridination, will be described. Our efforts to generate HPS resulted in serendipitous access to a new  $P_2S$  solid-state material of interest for its electronic properties. Finally, the chemistry of PN as a ligand in a transition-metal complex with singlet phosphinidene reactivity will be discussed. Gas-phase studies include molecular-beam mass spectrometry, microwave spectroscopy, and negative-ion photoelectron spectroscopy; data from the gas-phase studies complement the solution-phase synthetic chemistry and will be discussed in connection with computational studies for wavefunction analysis including natural bond orbital (NBO) methods.