# Catalytic dehydrocoupling of phosphines en route to the synthesis of π-conjugated materials

Dehydrocoupling of primary phosphines was applied to make phosphorus-phosphorus bonds using a Zr catalyst. A catalytic dehydrocoupling reaction was carried out to form known dimers $[(C_2H_4)_2(PH)]_2$ from 1,2-diphosphinoethane and $[(C_6H_4)PH_2(\mu\text{-}PH)]_2$ from *o*-bisphosphinobenzene. Further understanding of the mechanism of dehydrocoupling primary and secondary phosphines to form phosphorus-phosphorus bonds was gained by study of the thermal decomposition of zirconium complexes. The relationship of steric and electronic properties of phosphorus in *hetero*dehydrocoupling reactions will also be presented. Catalytic dehydrocoupling reactions of certain bisphosphine substrates were explored to form phosphorous-phosphorous bonds in route to making conjugated organophosphorus materials. One of the emerging synthetic applications of phosphorus containing materials is in organic π-conjugated polymers and oligomers. It has been observed that phosphorus-containing polymers are reactive and readily oxidize because phosphines are well known to undergo rapid oxidation to phosphine oxides. The oxidation of these polymers afford dramatic changes to the UV-visible spectroscopic properties where the derivatives display blue shifted π–π* absorption bands and also change in the structure of polymers. These organophosphorus polymers and oligomers that are potentially π-conjugated system are known to exhibit novel properties as well as the functional groups on the linkers will influence the optical and electronic properties of the material.