IL21 – The Evolution from FLPs to Electrophilic Phosphonium Cations and Hydrodefluorination and C–F Functionalization

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Suitably selected combinations of main group Lewis acids and bases constitute frustrated Lewis pairs (FLPs) were shown to activate hydrogen. This has allowed the development of unprecedented metal-free catalytic hydrogenations of C=N bonds, anilines, N-heterocycles, olefins, polyaromatic hydrocarbons and most recently ketones and aldehydes. This conceptual advance has been furthered leading to the development of electrophilic phosphonium cations (EPCs). These species prove to be highly Lewis acidic species that can effect CF bond hydrodefluorination catalysis. In addition, these Lewis acids are useful for hydrosilylations, dehydrocouplings, ketone deoxygenation and in FLP hydrogenations. More recently, we have extended the reactivity of EPCs to effect the catalytic Fiedel-Crafts arylation of CF₃ groups as well as benzyl fluorides. Such reactivity has little precedent and provides a new and highly variable approach to organic derivatizations. The implications of these findings for applications of main group species in catalysis is considered in this lecture.

References