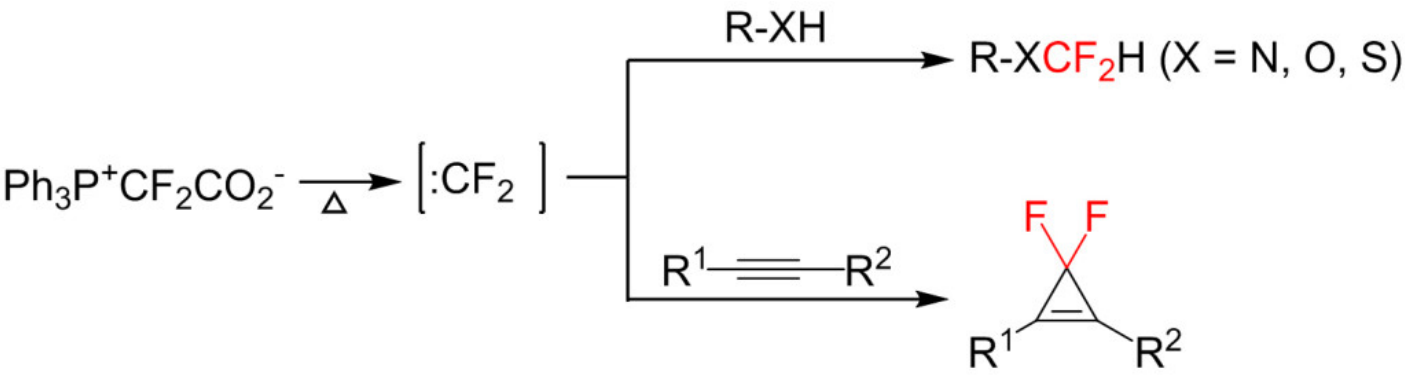
Difluorocarbene generated by decarboxylation

As the past decades have witnessed the sharp increase in the number of fluorine-containing pharmaceuticals and agrochemicals, significant efforts have been directed towards the development of efficient methods for the incorporation of fluorine atom(s) into organic molecules. Since the conversion of difluorocarbene can efficiently incorporate difluoromethylene group into molecules, difluorocarbene has found widespread application in a variety of transformations. Although a number of difluorocarbene reagents have been developed, they still suffer from high volatility or hygroscopicity, or the use of base or additive to produce difluorocarbene. We have previously shown that difluoromethylene phosphobetaine ($Ph_3P^+CF_2CO_2^-$, PDFA) is an efficient difluorocarbene precursor and can generate difluorocarbene simply via decarboxylation and the subsequent dissociation of P-CF_2 bond. Herein we describe the utilization of PDFA in difluoromethylation of activated *X*-H bond (X = N, O and S), difluoromethylation of aliphatic thiols, and *gem*-difluorocyclopropenation of alkynes.



Many difluorocarbene precursors can be successfully applied to the difluoromethylation of activated *X*-H bond (X = N, O and S), but their applicability is limited due to the basic reaction conditions. In sharp contrast, we found that almost all of *N-, O-* and *S*-difluoromethylation with PDFA can occur smoothly under mild conditions without the presence of base.

gem-Difluorocyclopropenation of alkynes with difluorocarbene has received much attention in synthetic chemistry recently. Most of the reported methods still lack generality due to harsh reaction conditions, the use of highly toxic or volatile reagents, low product yields, or inconvenient operations. Our protocol established herein can be successfully applied to *gem* -difluorocyclopropenation of various alkynes just by heating a mixture of alkyne and PDFA.

Publication

Difluoromethylation and gem-difluorocyclopropenation with difluorocarbene generated by

decarboxylation.
Deng XY, Lin JH, Zheng J, Xiao JC.
Chem Commun (Camb). 2015 May 25