

IV. Compounds with Phosphorous–Hydrogen Bonds

The search for less problematic hydrogen-atom transfers for use in the Barton-McCombie reaction has led to compounds with phosphorus–hydrogen bonds. These include dialkylphosphine oxides (**11**), alkyl phosphites (**12**), hypophosphorous acid (**13**), and salts of hypophosphorous acid (**14**) (Figure 2). All of these compounds can function as inexpensive, nontoxic hydrogen-atom transfers that form the chain-carrying radicals needed for reaction and do not produce byproducts difficult to remove.^{3,10,57} An example of a reaction in which hydrogen donation is from a P–H bond is shown in eq 13.⁵⁸

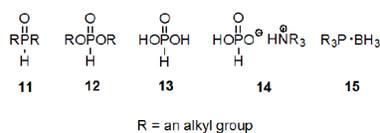
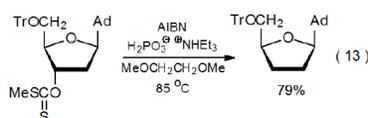


Figure 2. Hydrogen donors with P-H or B-H bonds



Alkyl phosphites (**12**) are excellent hydrogen-atom transfers, but reactions involving these compounds have the disadvantage of not being able to be initiated by 2,2'-azobis(isobutyronitrile); benzoyl peroxide usually is the initiator.^{3,10} Reactions in which the hydrogen-atom transfer is a dialkylphosphine oxide (**11**), hypophosphorous acid (**13**), or a salt of hypophosphorous acid (**14**) can be initiated by AIBN.^{9,57} Because it is difficult to completely remove water from hypophosphorous acid and its salts, these donors are less attractive choices when moisture sensitive compounds are reacting.⁹

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