For many years the most important organometallic compounds for synthetic purposes have been the organomagnesium halides, or Grignard reagents. They are named after Victor Grignard, who discovered them and developed their use as synthetic reagents, for which he received a Nobel Prize in 1912. As already mentioned, these substances customarily are prepared in dry ether solution from magnesium turnings and an organic halide:

\[
\text{CH}_3\text{I} + \text{Mg} \xrightarrow{\text{ether}} \text{CH}_3\text{MgI} \quad 95\% \text{ yield}
\]

Chlorides often react sluggishly and, in addition, may give an unwelcome precipitate of magnesium chloride, which, unlike magnesium bromide and iodide, is only very slightly soluble in ether. Organomagnesium fluorides eluded preparation until quite recently.

Although we usually write the structure of a Grignard reagent as \(\ce{RMgX}\), in which \(\ce{X}\) is a halogen, the structure of the reagent in ether solution is more complex. There is a rapidly established equilibrium between the organomagnesium halide \(\ce{RMgX}\) and the corresponding dialkylmagnesium \(\ce{R_2Mg}\):

\[
\ce{2 RMgX} \rightleftharpoons \ce{R_2Mg} + \ce{MgX_2}
\]

Both of these species, \(\ce{RMgX}\) and \(\ce{R_2Mg}\), are reactive, and in ether solvents are solvated by coordination of the ether oxygen to magnesium. They further associate as dimers or higher polymers in solution. Although it is an oversimplification to regard a Grignard reagent as \(\ce{RMgX}\), most of the reactions can be rationalized easily by this simple structure.

**Contributors**