

UNIT 6 • HALOALKANES AND HALOARENES

Reaction of Haloalkanes with Metals

Building Organometallics: The
Grignard and Wurtz Reactions

Key Vocabulary

Organometallic Compound — A compound containing a direct carbon-metal bond.

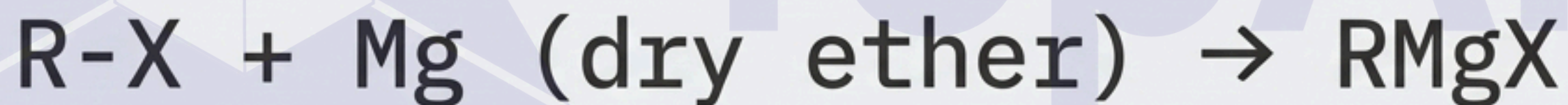
Grignard Reagent — An alkyl magnesium halide (RMgX), highly reactive intermediate.

Wurtz Reaction — The coupling of two alkyl halides using sodium to double the carbon chain.

Grignard Reagent Formation



Discovered by Victor Grignard in 1900, most organic chlorides, bromides, and iodides react with magnesium metal to create highly versatile carbon-metal bonds.



The magnesium metal physically inserts itself between the alkyl group (R) and the halogen (X).



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Inside the Grignard Bond

The RMgX molecule has a dual personality. Its unique reactivity comes from two completely different types of bonds existing side-by-side.



Covalent but Polar

Carbon is more electronegative than magnesium, pulling electron density towards itself and creating a highly nucleophilic carbon.

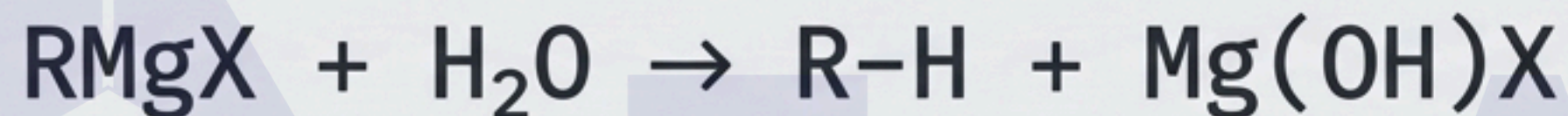


Essentially Ionic

The bond between the electropositive magnesium and the highly electronegative halogen is fundamentally an ionic electrostatic attraction.

Proton-Sensitivity Spotlight

Because the alkyl group acts as a powerful carbanion (R^-), Grignard reagents are highly reactive bases. They will steal a proton from almost anything.



JEE Trap Alert: Always Keep It Dry

Watch for this: Grignard reagents must be prepared in **dry ether**. Even traces of moisture, alcohols, or amines act as proton source, instantly destroying the reagent and converting it into a simple hydrocarbon.

The Wurtz Reaction

When alkyl halides react with sodium metal in dry ether, two alkyl groups couple together. This is a primary method for stepping up a carbon chain.



**Double the
Carbon Count!**

Creates a symmetrical hydrocarbon containing exactly twice the number of carbon atoms as the original halide.

Key Takeaways

- **Grignard Formation (RMgX):** Magnesium inserts into the C-X bond in dry ether. The resulting C-Mg bond is highly polar covalent, acting as a powerful base. *Any proton source will destroy it.*
- **Wurtz Reaction (R-R):** Reacting an alkyl halide with sodium metal in dry ether couples the molecules, producing a symmetrical hydrocarbon with double the carbon atoms.



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