Decomposition Reactions

Skills to Develop

- Describe decomposition reactions with chemical equations

Decomposition reactions are very common, and this word is used so much that many chemists just say "decomp". When people use this word in the lab, they might just mean that something didn't work, or that a chemical reacted in an unwanted way, especially while it was sitting in a bottle for a long time. The official meaning of decomposition is a little bit more specific, and means a reaction in which one chemical splits into two or more chemicals, like this:

$$A \rightarrow B + C \tag{1}$$

Decomposition reactions are often undesirable, but not always. For instance, many explosions are decompositions, and explosives are very important for many purposes other than weapons. Decomposition reactions might be hard to predict at first.

Some Simple Decomposition Patterns

The decomposition reactions in intro chemistry classes often result from heating a substance. For instance, when heated or struck, a salt of a complex anion (chlorate, carbonate, azide) may lose a gas (oxygen, carbon dioxide or nitrogen) leaving behind a simpler salt or metal. This could happen explosively, depending on the compound. Or, when heated, a metal hydroxide loses water to form the metal oxide (the reverse of the basic anhydride combination reaction). Here are some examples:

$$CaCO_3(s) \rightarrow CaO(s) + CO_2(g) \tag{2}$$

$$2NaN_3(s) \rightarrow 2Na(s) + 3N_2g) \tag{3}$$

$$2KClO_3(s) \rightarrow 2KCl(s) + 3O_2(g) \tag{4}$$

$$Cu(OH)_2(s) \rightarrow CuO(s) + H_2O(g\ or\ l) \tag{5}$$

Note

Students often get confused into thinking that combination reactions, the opposite of decomposition reactions, are called composition reactions. Actually, composition is not a type of reaction, rather, it has a different meaning. **Composition** means the ratio of elements in a compound, such as 75% C and 25% H.

Contributors and Attributions

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