

# What Are Alkali Metals?

**Alkali metals** include all of the elements in column 1A of the periodic table: hydrogen, lithium, sodium, potassium, rubidium, cesium, and francium. These metals are united by the fact that they all have one electron in their outermost layer of electrons.

For the most part, the elements listed above also like to lose the electron in their outermost layer and do so easily. However, because hydrogen is so small, it does not lose its one electron easily and tends to behave more like a nonmetal. Francium is a very rare element that decays quickly; it's estimated that there's only ever one atom of francium present on earth at any given time! For these reasons, the bulk of this lesson will focus on lithium, sodium, potassium, rubidium, and cesium.

## Properties and Characteristics

Alkali metals are silvery, soft, and not very dense. They can easily be cut with a butter knife, and cesium can even melt in the palm of your hand. They have low melting points and are incredibly reactive--so reactive that they must be stored in special solutions or containers to prevent an unintended reaction. Part of what makes alkali metals so reactive is that they have one electron in their outermost electron layer. Like so many other metals, the alkali metals want nothing more than to have electronic structures like their famously stable and unreactive cousins, the noble gases.

It takes very little energy to remove that outermost electron from an alkali metal. Thus, alkali metals easily lose their outermost electron to become a +1 ion. This happens so often that it is rare to find a sample of an alkali metal with all of its electrons; most alkali metals occur in their ionic +1 form.

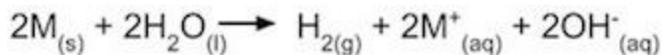
The energy needed to remove an electron from an element is called the **first ionization energy**. The alkali metals have the lowest first ionization energies

of all of the elements. In fact, as you go down the 1A column, the first ionization energies get lower and lower, making cesium the most easily ionized element on the periodic table.

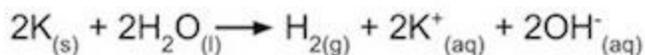
## Reactions

Reactions with alkali metals are among the most exciting--and the most dangerous. Generally speaking, the easier it is to remove an electron, the more energetic the reaction will be. The ease of removing an electron from an alkali metal translates to a fantastic release of energy.

This principle is well demonstrated in the reaction of an alkali metal with water. Below is the generic form of an alkali metal (represented by M) with water and the chemical reaction for potassium metal reacting with water. The alkali metal added to water makes hydrogen gas, alkali ions, and hydroxide ions.



The generic reaction between an alkali metal (M) and water. Products include hydrogen gas, alkali metal ions and hydroxide ions.



The reaction between potassium metal and water produces hydrogen gas, potassium ions and hydroxide ions.