

1.4 Calcium metal reactivity with water

Subjects: Introduction to chemistry, elements - behavior of alkaline earth metals, periodic trends, chemical reactions

Description: A piece of granular calcium metal is added to water. After a few moments a vigorous reaction takes place producing hydrogen gas and calcium hydroxide.

Materials:

Calcium metal, granular†

Water

400 mL beaker, (watch glass or petri dish for smaller scale or use larger 2 or 4 L beaker above prep shelf for larger scale)

Phenolphthalein† (optional)

†Located in the general chemical storage cabinets. Phenolphthalein is located in the flammables cabinet.

Procedure:

Note: Use the document camera for presentation in a large lecture hall.

1. Fill the beaker with water.
2. Add several drops of indicator (optional).
3. Add a granule (pea size) of calcium metal to the water.
4. Observe the evolution of H₂ gas (and the color change of the solution to indicate that the reaction produces basic calcium hydroxide.)

Discussion:

The reaction of calcium and water is given below:



Calcium metal is an alkaline earth metal found in Group 2A and reacts with water to form calcium hydroxide and hydrogen gas. Group 2A metals don't have as high a solubility in water as Group 1A, which is why the reaction of calcium (or magnesium) in water goes faster in warm water and also explains why calcium is found in various minerals. The reaction is not as vigorous or dangerous as the highly reactive alkali metals Na, K, or Li found in Group 1A, but gives an indication of the reactivity of these metals.

Because calcium hydroxide is basic, adding an indicator will show the solution changing from neutral to basic.

Safety: Hydrogen gas is produced during the reaction. If not collecting the gas, perform well-ventilated area.

Disposal: Add a small amount of HCl to clear up the hydroxide in solution and flush down the drain with plenty of water.

References:

1. L. Summerlin, C. Borgford, J. Ealy; *Chemical Demonstrations: A Sourcebook for Teachers*; Volume 2; 1987; p. 51-52
2. Prof. Voigtman