

Reactivity of Alkaline Earth Metals

Description: Reactivity of Mg and Ca are compared by reacting both with H₂O, dilute acid, and O₂.

Materials:

Mg ribbon
Ca
water
dilute acetic acid

Petri dishes
Bunsen burner
candle on a stick
250 mL filter flask
Balloons, rubber stoppers
tongs

Procedure:

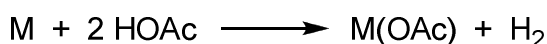
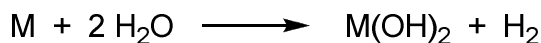
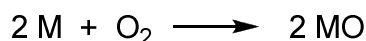
For large lecture halls, project demonstration using a document camera. For the burning of Mg, turn lights off in lecture hall.

1. For reactivity in H₂O, place Mg and Ca in separate Petri dishes containing water. No reaction is observed for Mg while some effervescence is noticed with Ca.
2. For reactivity with dilute acid, add Mg and Ca to separate 250 mL filter flasks with balloons attached to the side arm. Add dilute acetic acid to the flask and stopper. Once reaction is complete the balloon can be ignited to test for the composition of the gas produced.
3. For reactivity with O₂, burn Mg ribbon using tongs in a Bunsen burner flame. **INFORM STUDENTS NOT TO LOOK DIRECTLY AT FLAME.** For reaction of Ca with O₂, the video demonstration is preferred to avoid potential accidents.

NOTE – Looking directly into the Mg flame can cause permanent damage to retina.

Discussion:

The alkaline earth metals are less reactive and thus more difficult to initiate a reaction when compared to the alkali metals. A high heat source is needed for Mg combustion. The burning Mg ribbon produces an intense white light and ash residue. Magnesium and calcium do not react as violently with water. Dilute aqueous acid will decompose calcium faster than water alone to generate hydrogen gas.



Safety: When burning Mg, be careful of its heat and the intensity of its light. Warn students to not look directly at the burning flame. Dilute acid will irritate skin and eyes. If you have contact with the acid, wash it off. Wear safety goggles and gloves. Keep a safe distance while igniting balloons filled with H₂ gas.

Disposal: Make sure materials have completely reacted before disposal. Remaining aqueous solutions can be flushed down the drain with plenty of water. MgO can be disposed of in a solid waste container.

References:

Shakhashiri, B. Z. In *Chemical Demonstrations: A Handbook for Teachers of Chemistry*; The University of Wisconsin Press: 1983; Vol. 1, p 38-39.

Shakhashiri, B. Z. In *Chemical Demonstrations: A Handbook for Teachers of Chemistry*; The University of Wisconsin Press: 1989; Vol. 1, p 90-92. (combustion of Mg in CO₂)

Video:

<http://www.youtube.com/watch?v=LJz13QW58cY> (burning Ca)

<http://video.google.com/videoplay?docid=8310194143277101465&ei=lviewSpvCFMvclQfLo5nEAg&q=burning+magnesium&hl=en&client=firefox-a#> (burning Mg in O₂ atmosphere)

<http://www.youtube.com/watch?v=qrjYb1Oy-Pc> (burning Mg and addition of H₂O)

http://www.flixya.com/video/79808/Burning_Magnesium_In_Dry_Ice (burning Mg in dry ice)