

#### 4.8 Measuring relative strength of acids using magnesium

**Subjects:** Chemical reactions, properties of acids, gas forming reactions, kinetics

**Description:** The reaction of magnesium metal with different acids is used to measure their relative strengths. Hydrogen gas is formed during the reaction. Stronger acids will produce a more vigorous reaction with more bubbling. The increased bubbling with acids of different concentrations also demonstrates the affect of concentration on a reaction.

**Materials:**

1M Hydrochloric acid‡

0.1M Hydrochloric acid‡ (Optional: to show relative strength of concentration of same acid and rate of reaction)

1M Acetic acid‡

1M Boric acid‡

Magnesium ribbon

4 150 ml beakers

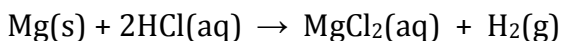
‡Hydrochloric acid is stored in the cabinet under the hood. Acetic and boric acid are stored in the solutions storage cabinets.

**Procedure:**

1. Be sure that the Mg ribbon is clean.
2. Label beakers with each acid.
3. Pour acids into respective beakers and add the magnesium. Observe H<sub>2</sub> gas evolution to indicate relative strength of each acid.
4. Results show that strength of acids is as follows HCl > acetic acid > boric acid.
5. The reaction in boric acid is too slow to observe during the lecture period.

**Discussion:**

Rate of dissolution of magnesium is dependent upon strength of acid in solution. The reaction of magnesium with HCl is given below:



Hydrogen gas is produced along with the metal halide. The stronger the acid, the faster the rate of reaction and thus the amount of time that effervescence is observed becomes shorter.

**Safety:** Wear proper protective equipment including gloves and safety. Concentrated solutions of acids can irritate the skin and cause burns. Vapors of acids are extremely irritating to the eyes and respiratory system

**Disposal:** Materials can be disposed of in an aqueous waste container. Excess of acid can be neutralized and flushed down the drain with plenty of water.

**Reference:**

1. NCSU Department of Chemistry Lecture demonstration web page:  
<http://www.ncsu.edu/project/chemistrydemos/DemoList.html>