

Making Materials Matter - Corrosion Experiment

This experiment demonstrates the effect of corrosion on everyday materials. Corrosion is the chemical reaction, which oxidises a material (primarily metals and alloys) into a corroded form. This takes place via an ion-conductor and an oxidising species – usually oxygen. Metal components are often exposed to a corrosive environment, and if they are not designed to be resistant, or their protection fails, then failure by corrosion is inevitable. Corrosion is big business and accounts for a large proportion of failed components. In this experiment, students can investigate several of the different parameters, which influence the rate and type of corrosion of some common materials.

Required Materials

- Test tubes and bungs
- 10x10 mm square 1 mm thick pieces of metal (e.g. copper, mild steel and stainless steel)
- Different corrosive solutions (e.g. hydrochloric acid, sodium hydroxide, tap water, distilled water, salt water)

Method

1. Note down the initial condition of the metal.
2. Place one piece of metal in each test tube and then cover with one of the liquids or leave the tube open to the air.
3. Note any initial reactions of the metal: bubbles, colour change etc.
4. Leave the samples for a specific length of time.
5. Take the samples out and wash them.
6. Observe any changes from the initial conditions.

Optional: take a time lapse of the materials in the solutions to create a video.

Optional: use an optical microscope to look at the surfaces in detail.

Variables you can adjust or investigate:

- The duration of the exposure
- The material exposed (and its condition: painted, polished etc.)
- The environment of the sample:
 - Water, acid, alkali
 - The concentration/pH
 - Whether it has a stopper in the top or not
 - Whether there is an oil layer on top or not

Results

Which environments caused what effects? Which materials were most sensitive?



1 mm

Mild steel exposed to hydrochloric acid for 4 days

