

## Course 2 – Project 1

### Experimental Procedure

#### Behavior of Automotive Materials in Corrosive Environment & Galvanic Corrosion

##### Background

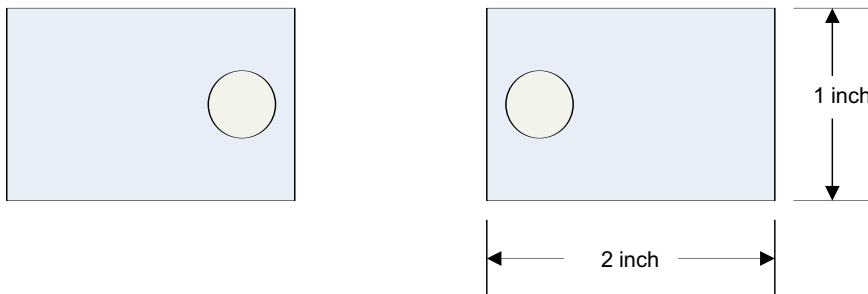
Automotive designers use a variety of materials to meet performance, weight, fuel economy, style, cost, and durability requirements. One important consideration in selecting a material is how long it will survive in the expected environment. Customers will not be satisfied if their new car starts to fall apart too soon. In order to meet some of the requirements listed above, designers are looking to join several different types of materials together to make a hybrid assembly. When different materials are bonded with intimate electrical contact a type of corrosion called galvanic corrosion can occur.

##### Purpose

The purpose of this experiment is to test the corrosive resistance of different materials and combinations of materials in the a typical corrosive atmosphere encountered by many automobiles.

##### Materials

- 1 inch by 2 inch samples of materials each with a hole drilled near one end
- Metal screws
- Non-conducting adhesive (e.g., Loctite Quick-set adhesive available at hardware store)
- Five inch diameter Beakers with cover dish (30)



The samples are made of the following materials:

- Bare steel
- Galvanized steel
- Bare Aluminum
- Carbon fiber composite

##### Procedure

Sample Preparation:

1. You will prepare samples made from the following combinations:
  - Bare Steel to bare steel with screw
  - Galvanized steel to galvanized steel with screw
  - Aluminum to aluminum with screw
  - Fiber Composite to fiber composite with screw

- Bare steel to galvanized steel with screw joint
  - Bare steel to galvanized steel with adhesive joint
  - Bare steel to bare aluminum with a screw joint
  - Bare steel to bare aluminum with an adhesive joint
  - Bare steel to carbon fiber composite with screw connection
  - Bare steel to carbon fiber composite with adhesive connection
2. Using the materials provided, bond the samples together as indicated in the combination listing above.
    - a. For samples that are screwed together, the screw is inserted in the holes and tightened in order to make intimate contact of the sample side to sample side.
    - b. For the adhesive samples, care should be exercised to bond the sample sides without any sample to sample contact (no electrical contact).
  3. Make three duplicate samples of each type.

#### Solution Preparation

1. Three different sodium chloride solutions will be prepared to the following specifications:
  - Distilled Water
  - 10% NaCl Solution
  - 25% NaCl Solution

#### Initial Sample Weighing

1. Create a table for each beaker sample to record data
2. Weigh each sample and one sample of each type placed in a beaker with one of the three solutions
3. Place a cover dish over each beaker and allow to remain in the solution for one week.

#### Weekly Data Collection

1. Every week, remove each sample from the beaker, clean and re-weigh.
2. Record your results.
3. Discard the solution in each beaker and replace with new solution of the same composition
4. Re-immerses the same sample to the same beaker.
5. Test again in one week
6. Continue the weekly testing of each sample until the school semester is over or until your teacher instructs you to stop.

### DATA ANALYSIS

Using the data collected, prepare an analysis of the data as instructed by your teacher.