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Instructions for Conducting Corrosion Coupon Tests

Corrosion coupon testing is used extensively to aid in the selection of materials of construction for equipment and piping. Wah Chang corrosion coupons enable you to test our materials in your corrosive media, under actual process conditions.

Each coupon comes metal-stamped with a material identification and coupon number. The material's heat number, density, surface condition, and other attributes will be listed on the packaging. Also, on request, a compatible alloy wire for hanging the coupon can generally be made available.

The standard experimental method for conducting corrosion coupon tests requires a material sample of known weight and surface area to be placed in the test environment for a given period of time. At the conclusion of the test period, the sample is re-weighed and a corrosion rate is calculated based on the weight change. For further technical details on corrosion coupon testing, you may wish to refer to ASTM G 1, G 4, G 31, G 46, and/or NACE TM-0169.

Before beginning the test, please be sure to review the notes below.

- We generally ship coupons that are pre-measured, pre-weighed, and pre-washed. If will be performing any of these activities yourself, we recommend following these guidelines:
 1. Clean the test coupon with soap and water or a solution of 5-10% aqueous ammonia. Use a nylon or non-metallic brush (e.g. a toothbrush) to remove any adherent film or debris. Thoroughly rinse with water and dry.
 2. Determine total coupon surface area by measuring its length, width, and height to the nearest 0.001 inch. Be sure to subtract the area of any mounting holes.
 3. Weigh the test coupon to the nearest 0.1 mg on an analytical balance.
- In deciding where to position the coupon(s) for testing, care must be taken to mount the coupons so that they are exposed to the corrosive conditions of interest.
 1. Coupons should be mounted in such a way that they are securely held. ASTM G 4 has recommendations for specimen holders and test rack designs.
 2. Ideally, reactive metal corrosion coupons (e.g. Nb, Ta, Ti, Zr) should not be tested alongside other sample metals; however, if samples of other materials are present, the reactive metal test coupon(s) should be placed closest to the inlet stream of the process solution. This limits potential



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contamination of the solution by the corrosion products of the other metals, which may affect the corrosion resistance of reactive metals.

3. Materials used to mount the coupons should be resistant to the chemical environment. To prevent galvanic effects, you may wish to eliminate any metal-to-metal contact with the coupons. Consider using non-conductive materials such as Teflon wire to secure the coupons, with consideration of the temperature and corrosion limits in your solution .
4. **If you have any questions regarding the proper installation of corrosion coupons into your system, please contact Wah Chang for technical assistance at (541) 967-6977 or e-mail custserv@wahchang.com.**

- Place the coupon in the test environment. Be sure to record exposure in and out times.
- At the conclusion of the test period, the coupon should be cleaned, dried, re-weighed, and analyzed as follows:
 1. Carefully remove the coupon from the test environment and rinse with water. Final rinse with de-ionized water, if available.
 2. Remove any loose surface deposits by brushing with a nylon or non-metallic brush (e.g. toothbrush).
 3. Dry the test coupon thoroughly. For coupons with thick oxide films, drying at 80°C for at least 20 minutes is recommended to help drive out absorbed water.
 4. Weigh coupon on an analytical balance to the nearest 0.1 mg.
 5. Calculate the Corrosion Rate as follows:

$$\text{Mils per year (mpy)} = (534 \times \Delta W) / A \times T \times D$$

$$\text{Millimeters per year (mm/y)} = 0.0254 \times \text{mpy}$$

Where ΔW = Weight loss of coupon (mg)

A = Total Surface Area of coupon (in²)

T = Exposure time (hrs)

D = Density of coupon (g/cm³)

6. The physical appearance of the coupon should be observed for the presence of any pitting, as well as the type and location of any other corrosion attack. You may wish to refer to ASTM G 46 for details on the analysis of localized corrosion
7. **If needed, contact Wah Chang for technical assistance at (541) 967-6977 or e-mail custserv@wahchang.com**