Corrosivity of Peraguard Against Mild Steel

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Introduction

Enviro Tech Chemical Services, Inc. is currently in the process of obtaining U.S. EPA registrations for a novel product, Peraguard. Peraguard is a solid form powder that, when in the presence of water, reacts to form low concentrations of peracetic acid (PAA). Peraguard is designed to be scattered across the floor, in contact with various substances within warehouses, factories, and other places with heavy foot traffic in need of sanitization. Most of these locations contain steel equipment. Therefore, it is of interest to determine the corrosivity of Peraguard in a concentrated powder form and in a diluted liquid form in direct contact with mild steel.

Materials and Methods

Two mild steel (C1010) coupons with a nominal size of 3" × ½" were obtained. Each coupon was thoroughly washed with mild detergent and water, dried, and rinsed with acetone to remove any residual oils. The exact dimensions of each coupon were measured using a caliper and each coupon was weighed on an analytical balance.

Enviro Tech's Peraguard powder was obtained. For the concentrated powder corrosion study, one of the prepared coupons was placed into a plastic sample cup and approximately 4 ounces of solid Peraguard powder was added to the sample cup to completely cover the coupon. For the diluted liquid form, 45 grams of Peraguard powder were added to 120 mL of softened Modesto city water. The second mild steel coupon was then added to the diluted solution in a plastic sample cup. The two samples were covered and allowed to sit for 13 days. The solid powder was allowed to sit undisturbed for the entire study time and the diluted solution was replaced on days 4 and 10.

Figure 1. Mild steel coupons prior to contact with Peraguard.

After 13 days, the coupons were removed from the sample cups and thoroughly cleaned to remove loose corrosion deposits. Acetone was again used as a final rinse on the coupons. The coupons were reweighed on the analytical scale and the final masses recorded.

The corrosion rate was calculated using the following equation:

$$\text{Corrosion Rate (mpy)} = 534 \times \left(\frac{W}{DAT}\right)$$

Where:

W = Weight loss of the coupon over the 13 day interval (mg)
D = Density of the specific metal (g/cm^3)
A = Area of exposed surface of the coupon (in^2)
T = Contact time of the coupon to the Peraguard test material (hours)

Description	Mass Loss (mg)	Density (g/cm^3)	Corrosion Rate (mpy)
Concentrated Solid	0.0	7.872	0.00
Diluted Liquid	5.2	7.872	0.32

Figure 2. Final cleaned coupons after 13 day contact time. Corrosion can be seen on the upper (dilute liquid sample) coupon. No corrosion is seen on the bottom (solid sample) coupon.

One common guideline for metal corrosion rates is:

- < 5 mpy very good
- 5-10 mpy acceptable/marginal
- >10 mpy unacceptable

Conclusions

- Mild steel (C1010) was submerged into concentrated solid Peraguard and diluted Peraguard liquid solution and allowed to sit for 13 days. The corrosion rates were calculated based on the weight loss of the coupons:
  - Concentrated solid Peraguard corrosion rate of 0.00 mpy
  - Diluted liquid form corrosion rate of 0.32 mpy
- A corrosion rate of 0.00 mpy indicates that solid Peraguard is not corrosive to mild steel.
- A corrosion rate of 0.32 mpy shows that diluted, liquid Peraguard is very mildly corrosive to mild steel, indicating that mild steel is a very good material for use in contact with liquid Peraguard.