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Laboratory Test to Evaluate the Vapor-Inhibiting Ability of Volatile Corrosion Inhibitor Materials for Temporary Protection of Ferrous Metal Surfaces

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Foreword

Volatile corrosion inhibitor (VCI) materials provide temporary corrosion protection for the surfaces of metal parts that are not in contact with the inhibitor. Temporary protection is afforded as long as there is a moderately sealed enclosure containing the metal parts and the source of the VCI, which may be in the packaging package itself. The duration of protection may be months to years before the parts are removed from the enclosure and put to use, or before a more "permanent" coating such as paint is applied. A referenced NACE Standard Practice SP0487 includes VCI in the context of guidance and best practices for users of interim or temporary corrosion protection methods.

The purpose of this basic test of VCI function is to provide a repeatable one-day assessment of the Vapor Inhibiting Ability (VIA) of VCI materials to protect ferrous metal surfaces from corrosion (rusting), including protection of ferrous metal afforded by components of VCI classified for multi-metal protection. The essence of the test is to: (1) prescribe simple standard conditions of enclosure with vapor transport across a gap containing air, warm water vapor, and the VCI molecules, and (2) provide qualitative visual grading of the efficacy of corrosion protection of standardized low carbon steel specimens, as generally representative of ferrous metals. The method is derived from the military methods in U.S. MIL-STD-3010[1-4] propagated since the 1970s. It describes practices used for relatively high throughput VIA testing by industrial producers and users of VCI for quality control and comparisons in product development among competing VCI materials. Provision is also made to test for possible confounding effects of VCI and water absorption (desiccant effects) of VCI paper materials. Several other closely derived test standards were also propagated since the 1970s in other international regions, e.g., German military[5-6] and Japanese JIS standards. The variation among these methods can result in different outcomes.[7-8] The apparatus and grading scale of the test method are also used in comparisons of VCIs with corrosive contaminants.[9] Considerations of possibly analogous VIA testing for protection of non-ferrous metals have not proved feasible.[10]

Scope

This standard test method evaluates the vapor-inhibiting ability (VIA) of various forms of VCI materials for temporary corrosion protection of ferrous metal surfaces, which is also called the "VIA-Ferrous" test.

Rationale

This VIA test method is for the purpose of qualifying materials that provide VCI functionality using current commercial practices for reproducibility and productivity. This revision no longer includes details that duplicate the 2013 revision of Reference 1 used for military procurement qualification. In particular, this revision no longer includes a Grade 4 level of "no corrosion" by microscopic inspection. It also removes a test in Reference 1 that determines if copper is stained or corroded in contact with VCI materials, since VCI chemistries for which that test was developed are now essentially obsolete.