



ASTM B809

Test Method for Porosity in Metallic Coatings by Humid Sulfur Vapor (“Flowers-of-Sulfur”)

This test method is for determining the porosity of metallic coatings, where the pores penetrate down to a silver, copper, or copper-alloy substrate. It is suitable for coatings consisting of single or combined layers of any coating that does not significantly tarnish in a reduced sulfur atmosphere, such as gold, nickel, tin, tin-lead, and palladium, or their alloys. This method is designed to determine whether the porosity level is less than or greater than some value which by experience is considered by the user to be acceptable for the intended application.

A major use of this test procedure is for determining coating quality. Porosity tests are indications of the completeness of protection or coverage offered by the coatings, since the coatings in the previous paragraph are intended to be protective when properly applied. The porosity test results are therefore a measure of the deposition process control.

A particular purpose of the humid sulfur vapor test is for determining the quality of underplates of nickel or nickel alloy in those finish systems that have thin, 1.2 μm or less top layers above the nickel, since porosity in the underplate usually continues into such top layers. This test is often used as an environmental test to simulate many indoor humid atmosphere tarnishing and tarnish creepage effects. However, the chemistry and properties of these tarnish films may not resemble those found in other service environments. For such product performance evaluations, the test should only be used in combination with other performance evaluation tests.

Porosity tests differ from corrosion and aging tests, since the latter are intended to measure the chemical inertness of the coating. In contrast, in a good porosity test procedure the corrosive agent should not attack the coating. It must instead, clean, depolarize, or activate the substrate metal exposed by the pore, or both, and attack it sufficiently to cause reaction products to fill the pore to the surface of the coating.

The humid sulfur test is highly sensitive, and is capable of detecting virtually all porosity that penetrates down to copper or copper alloys. Since nickel is not attacked by moist sulfur vapor at 100°C or less, this test will not detect pores or cracks in the top coating if such pores or cracks do not penetrate through the nickel underplate overlaying the copper. The level of porosity in the



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coating that may be tolerable depends on the severity of the environment that the product is likely to encounter during service or storage. Also, the location of the pores on the surface is important. If the pores are few in number or away from the significant surfaces, their presence can often be tolerated.

The present test method can be used on samples of various geometries. It can also be used for selective area coatings, if allowance is made for tarnish creepage from bare copper alloy areas. This test is destructive in that it reveals the presence of porosity by contaminating the surface with tarnish films. Any parts exposed to this test method should not be placed in service.

(B809, B-809, B 809)

ASTM Standard B809, 2007, "Test Method for hardness of Electrical Contact Materials ," ASTM International, West Conshohocken, PA, 2007, DOI: 10.1520/B809-95, www.astm.org.