Using Ozone To Clean and Passivate Oxygen-Handling Hardware

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A proposed method of cleaning, passivating, and verifying the cleanliness of oxygen-handling hardware would extend the established art of cleaning by use of ozone. As used here, "cleaning" signifies ridding all exposed surfaces of combustible (in particular, carbon-based) contaminants. The method calls for exposing the surfaces of the hardware to ozone while monitoring the ozone effluent for carbon dioxide. The ozone would passivate the hardware while oxidizing carbon-based residues, converting the carbon in them to carbon dioxide. The exposure to ozone would be continued until no more carbon dioxide was detected, signifying that cleaning and passivation were complete.

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Metal Standards for Waveguide Characterization of Materials

Metal waveguide inserts can be tailored to have known scattering parameters.

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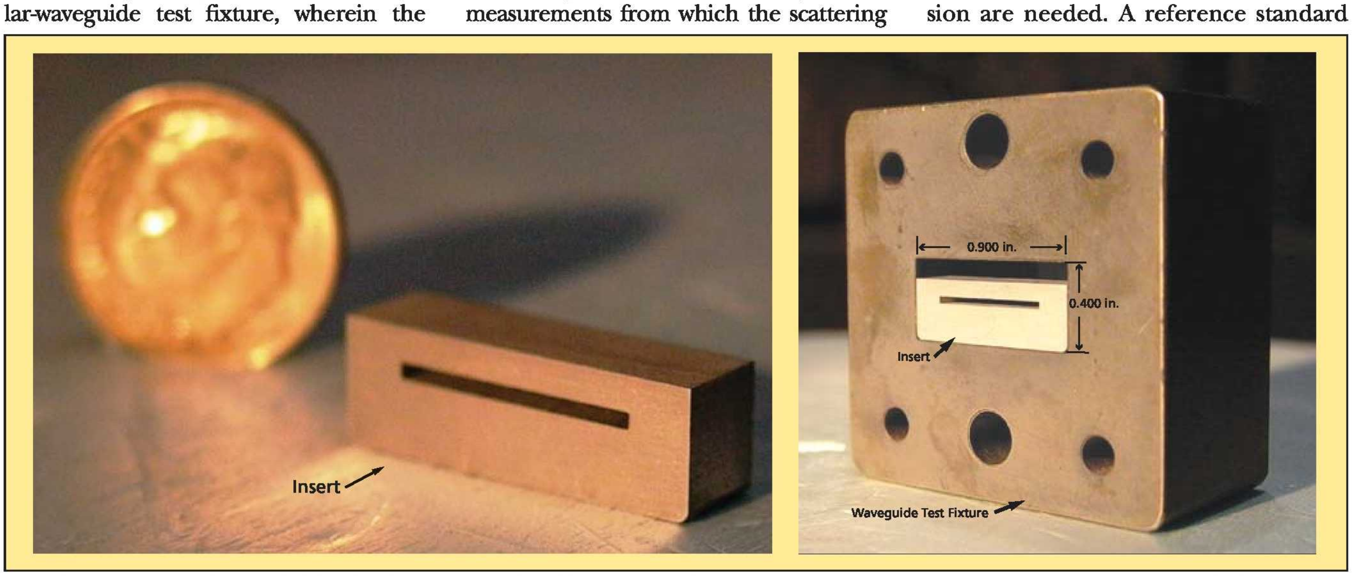
Rectangular-waveguide inserts that are made of non-ferromagnetic metals and are sized and shaped to function as notch filters have been conceived as reference standards for use in the rectangular-waveguide method of characterizing materials with respect to such constitutive electromagnetic properties as permittivity and permeability. Such standards are needed for determining the accuracy of measurements used in the method, as described below.

In this method, a specimen of a material to be characterized is cut to a prescribed size and shape and inserted in a rectangular-waveguide test fixture, wherein the specimen is irradiated with a known source signal and detectors are used to measure the signals reflected by, and transmitted through, the specimen. Scattering parameters [also known as "*S*" parameters (S_{11}, S_{12}, S_{21}, and S_{22})] are computed from ratios between the transmitted and reflected signals and the source signal. Then the permeability and permittivity of the specimen material are derived from the scattering parameters. Theoretically, the technique for calculating the permeability and permittivity from the scattering parameters is exact, but the accuracy of the results depends on the accuracy of the measurements from which the scattering parameters are obtained. To determine whether the measurements are accurate, it is necessary to perform comparable measurements on reference standards, which are essentially specimens that have known scattering parameters.

To be most useful, reference standards should provide the full range of scattering-parameter values that can be obtained from material specimens. Specifically, measurements of the back-scattering parameter (S_{11}) from no reflection to total reflection and of the forward-transmission parameter (S_{21}) from no transmission to total transmission are needed. A reference standard



The **Metal Rectangular-Waveguide Insert** is sized and shaped to fit the waveguide cross-section and to act as a band-stop filter having a notch frequency of about 9 GHz. The particular waveguide cross sectional dimensions, known in the industry as "WR-90," are for a nominal frequency range of 8.2 to 12.4 GHz.