**Analysis of the Complex Dielectric Permittivity Behavior of Porous Al\textsubscript{2}O\textsubscript{3}-SiC Composites in the 1 MHz – 18GHz Frequency Range\textsuperscript{1}**

JACOB BATTAT, JEFFREY CALAME, Naval Research Laboratory — The complex dielectric permittivity of electrically lossy, porous Al\textsubscript{2}O\textsubscript{3}-SiC composites was measured as a function of frequency over the range of 0.001-18 GHz (broadband). These composites were fabricated by an infusion method of incorporating SiC polymer precursor into porous alumina discs. Repeat polymer infusions and pyrolysis steps to 1000°C were carried out, with some samples undergoing an additional air-fire prior to each subsequent step. Generally, it was found that for non-air-fired samples, moderate, controllable losses were attainable over a broad frequency range with \( \log \varepsilon'' \) being inversely proportional to \( \log f \). By contrast, the dielectric loss attainable for air-fired samples was generally very low. For all samples, various aspects of the variation of permittivity components \( \varepsilon' \) and \( \varepsilon'' \) with frequency were analyzed, with a view to determine the various factors contributing to dielectric response. In addition, the ramifications of this behavior on the properties of the material as a lossy composite were addressed.

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