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Elucidation of the Microstructure of Carbon-Carbon Composites by Raman Microscopy SERGEY MAMEDOV, FRAN ADAR, EUNAH LEE, ANDREW WHITLEY, Horiba Jobin Yvon Inc. — Carbon-carbon composites are used in aerospace materials as well as some automotive, high-end sports and helmet applications. Their advantages include stiffness, strength, and light weight. Because of the importance of their applications, especially in aerospace, any technique that can characterize them is of interest. Images of a composite created on Raman microscope has been used to characterize a carbon-carbon composite. It is shown the information is encoded in both details of the spectral features and polarization behavior. Polarized Raman maps were collected using the 633nm laser and the 300g/mm grating. At each point in the map there is a spectrum that includes the G mode, the D mode (when present) and the overtone and combination bands between 2400 and 3300 cm^{-1}. Using multivariate techniques to extract information from the hyperspectral cube, it was possible to create Raman images where the fibers and the matrix carbon are differentiated, even though the spectral differences are quite subtle. Correlations between the polarized Raman images and standard polarized light microscopy enables determination of the orientation of the graphite planes in the matrix which can effect the physical properties of the composite.

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