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Structural and compositional characterization of "covetics" a new class of materials containing high C concentration[1] R.A. ISAACS, University of Maryland College Park, A. HERZING, National Institute of Standards and Technology, D.R. FORREST, A.N. MANSOUR, Naval Surface Warfare Center, M.C. LEMIEUX, Chemical Engineering Department, Stanford University, J. SHUGART, Third Millennium Metals, LLC, L. SALAMANCA-RIBA, University of Maryland College Park — "Covetics" are a new class of materials formed by the incorporation of high concentrations ($> 6wt\%$) of nanoscale carbon in a metal matrix. The carbon incorporates into the crystal structure of the host metal and remains dispersed after subsequent melting and re-solidification. The carbon is highly stable in these materials despite the absence of a predicted solid solution at such concentrations in the binary phase diagrams. Covetics have been shown to exhibit enhanced electrical, mechanical and thermal properties when compared with non-covetic metals. We have performed energy dispersive X-ray spectroscopy (EDS), X-ray photoelectron spectroscopy (XPS), X-ray absorption spectroscopy (XAS), SEM, TEM, STEM/electron energy loss spectroscopy (EELS), AFM, and Raman spectroscopy to investigate the structure of Al, Cu, and Ag covetics. Both bulk samples and thin films are investigated. Carbon was detected in the form of nanoparticles 5 nm - 200 nm in diameter with an interconnecting carbon matrix. The carbon is detectable by EDS and XPS, but not by analytical methods such as LECO and GDMS. Raman indicates a similar signal to that of CNTs in covetics. A detailed investigation of the morphology of the nanocarbon and the structure of several covetics will be presented.

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