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Incorporation of C in Cu for the Fabrication of Transparent Electrodes[1] ROMAINE ISAACS, HONGLI ZHU, COLIN PRESTON, PETER ZAVALI, University of Maryland, AZZAM MANSOUR, Naval Surface Warfare Center, MELBS LEMIEUX, LIANGBING HU, LOURDES SALAMANCA-RIBA, University of Maryland — The incorporation of carbon nanostructures into the copper lattice has the potential to improve the current density of copper to meet the ever-increasing demands of nanoelectronic devices. We report on the structure and properties of a new material formed by the incorporation of carbon in concentrations up to 10 wt% into the crystal structure of copper that we refer to as "Cu covetic". The carbon does not phase separate after subsequent melting and re-solidification despite the absence of a predicted solid solution at such concentrations in the binary phase diagram. Bulk samples, as well as thin films grown at room temperature and high temperature are investigated. X-ray photoelectron spectroscopy (XPS) confirmed that C incorporates in the bulk of the Cu. Transmission Electron Microscopy (TEM) shows that C forms a modulated structure in the crystal lattice, and Electron Energy Loss Spectroscopy (EELS) indicates that C-K edge has graphitic nature with *sp2* bonding. Copper covetic films exhibit greater transparency, higher conductivity, and resistance to oxidation than pure copper films of the same thickness, making them a suitable choice for transparent conductors.

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