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Effect of Vanadium Nitride Additive on the Structure and Strength Characteristics of Diamond-Containing Composites Based on the Fe–Cu–Ni–Sn Matrix, Formed by Cold Pressing Followed by Vacuum Hot Pressing

Abstract: We prepared samples of composite diamond-containing materials 10 mm in diameter and 8 mm in thickness, based on the 51Fe–32Cu–9Ni–8Sn matrix (wt %) with different (0–10 wt %) concentrations of vanadium nitride (VN), the physical the mechanical characteristics of which depend on the composition of the iron matrix. The optimal (cVN = 4%) concentration of vanadium nitride in the matrix of composites sintered in the temperature range of 20–1000°C at a pressure of 30 MPa for 5 min ensures the highest indices of the physicomechanical properties of the composites (Rbm = 1110 MPa and Rcm = 1410 MPa) due to the dispersion mechanism of strengthening and modification of the structure, that is, a decrease in the average grain size, the disappearance of pores, the formation of clusters of the inhibitor phase at the interphase boundaries, and the phase composition of the composites. All sintered samples containing VN powder additives in the charge are characterized by a more uniform distribution of phases and a more dispersed structure compared to a sample without VN additives. The structure of composites containing a VN **additive consists of**

a solid solution of nitrogen and vanadium in α-iron and a mixture of Fe, Cu, Ni, and Sn phases and primary and secondary dispersed phases of vanadium nitride.

Keywords: composite, iron, copper, nickel, tin, composition, vanadium nitride, concentration, vacuum hot pressing, structure, properties

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