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Sintering variables optimization, microstructural evolution and physical properties enhancement of nano-WC ceramics

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Abstract

In this research, the effect of different parameters of sintering on microstructural evolution, density and hardness of WC pieces produced by nano powders was studied. Spherical nano WC powders in which 80% of the powders were below 50nm diameter were pressurized in a steel mold under the pressure of 600 MPa. Tablets with diameter of 16 mm and thickness of 3 mm were produced out of this process. 0.8wt% Zinc Stearate powders were added to the initial powders as lubricant. A tube furnace at the pressure of one atmosphere under argon protective gas was used for sintering process. Sintering were performed on 1300^{o}C, 1400^{o}C and 1500^{o}C for 0.5, 1 and 2 h. Scanning Electron Microscopy, X-Ray diffraction, density measurement and Vickers hardness techniques were used to analyze the samples. Results showed that the best sintering condition is obtainable at sintering temperature of 1400^{o}C and 1 h.