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MICROSTRUCTURAL EVALUATION OF THE NBC-20NI CEMENTED CARBIDES DURING SINTERING

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Fine carbides in a metallic matrix (binder) form the microstructure of the cemented carbides. Grain size and binder content are the main variables to adjust hardness and toughness. These products are produced by Powder Metallurgy, and traditional route involves mixing carbides with binder by high energy milling, pressing and sintering. During sintering, a liquid phase promotes densification, and a final relative density higher than 99% is expected. Sintering is carried out at high temperatures, and dissolution of the carbides changes the chemical composition of the binder. To control grain growth of the main carbide, which reduces hardness, small quantities of secondary carbides are used. These additives limit dissolution and precipitation of the main carbides reducing the final grain size. This paper focused the structural and chemical evolution during sintering using NbC-20Ni cermets. Mixtures of very fine NbC carbides and carbonyl Ni powders were produce by intense milling. These mixtures were pressed using uniaxial pressures from 50 to 200MPa. Shrinkage was evaluated using dilatometric measurements under an atmosphere of dynamic argon. Samples were also sintered under vacuum in high temperature industrial furnace. The sintered samples were characterized in terms of density hardness, toughness and microstructure. DRX was the main tool used to evaluate the structural evolution of the binder. In situ chemical analysis helped to understand the dissolution mechanisms.