Effect of sintering process on the microstructure and microhardness of the powder mixture S509

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ABSTRACT

In this work, the Fe-1.8%Cr with 2% elemental nickel and 0.5% C with an additional 0.8%wt lubricant powder mixture was compacted using the uniaxial die pressing method. The sintering process was performed using the dilatometry method. A cross-section of the sintered sample was used to prepare the metallographic sample for microhardness measurement and microstructure observation. The specimens were compacted at three different pressure 600, 700, and 800 MPa. The green body was sintered with the maximum temperature of 1300 ^{o}C for four different heating rates 2.5,5.0,7.5, and 10 Kelvin/minute, and the samples were cooled down to room temperature under normal conditions. The density, microhardness, and microstructure of the sintered powder compact were investigated. The heating procedure up to sintering temperature is crucial; the majority of densification happens during this time. The experimental results indicated that a higher microhardness value is achieved at a higher heating rate. The optical micrograph shows a very similar microstructure for all the sintered samples, but the presence of different phases cannot be denied. The sample with the highest heating rate had the highest microhardness value due to the Martensite formation visible in the microstructure. The samples with the lowest heating rate have the lowest porosity and hence higher densification rate. The findings revealed that while compacting pressure and heating rate are important in creating denser parts, cooling rates must be altered to vary the microstructure.

Keywords: Microhardness, Microstructure, Dilatometry, Sintering, Martensite

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BIOGRAPHY

Ing. Prateek Srivastava is young Ph.D. Researcher working with Advance materials and Materials design and has a passion for learning numerical techniques to create models and perform simulations to optimize Powder metallurgical processes.

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