

## Production of Spherical Cementite within Bainitic Matrix Microstructures in High Carbon Powder Metallurgy Steels

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**Abstract :** The hardness-microstructure relationships of spherical cementite in bainitic matrix obtained by a different heat treatment cycles carried out to high carbon powder metallurgy (P/M) steel were investigated. For this purpose, 1.5 wt.% natural graphite powder admixed in atomized iron powders and the mixed powders were compacted under 700 MPa at room temperature and then sintered at 1150 °C under a protective argon gas atmosphere. The densities of the green and sintered samples were measured via the Archimedes method. A density of 7.4 g/cm<sup>3</sup> was obtained after sintering and a density of 94% was achieved. The sintered specimens having primary cementite plus lamellar pearlitic structures were fully quenched from 950 °C temperature and then over-tempered at 705 °C temperature for 60 minutes to produce spherical-fine cementite particles in the ferritic matrix. After by this treatment, these samples annealed at 735 °C temperature for 3 minutes were austempered at 300 °C salt bath for a period of 1 to 5 hours. As a result of this process, it could be able to produced spherical cementite particle in the bainitic matrix. This microstructure was designed to improve wear and toughness of P/M steels. The microstructures were characterized and analyzed by SEM and micro and macro hardness.

**Keywords :** powder metallurgy steel, bainite, cementite, austempering and spheroidization heat treatment

**Conference Title :** ICMME 2019 : International Conference on Metallurgical and Materials Engineering

**Conference Location :** London, United Kingdom

**Conference Dates :** January 21-22, 2019