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Characterization of air quenched valve seat insert obtained with AISI M3:2 high-speed steel

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This work is focused on the characterization of sintered valve seat insert (VSI) after heat treatment. Such VSI was obtained by powder metallurgy technique and fulfilled the requirement to replace cobalt and lead, used in the original alloy, due to their high cost and toxicological effect, respectively. The studied VSI is composed of a high-speed steel (AISI M3:2) powder admixed with iron powder and additives such as manganese sulphide, zinc stearate, graphite, carbides and copper, which was added through the metallic infiltration process. These powders characterization were carried out analyzing its particle size distribution and morphological aspects. The VSI was air quenched, and after that, it was double tempered at seven equidistant different temperatures, ranging from 100 °C until 700 °C. The VSI physical and mechanical properties were determined by means of its apparent hardness, apparent density and radial crush strength tests. The microstructural evaluation was performed etching the samples with Nital and then evaluating it with the support of the optical microscopy, scanning electron microscopy and energy dispersive spectroscopy. The chemical composition of the VSI was determined using the energy dispersive X-ray fluorescence spectrometer. The VSI best results was achieved, regarding its final application, by air quenching and double tempering it at 600 °C.

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