

Study of Ferritic and Austenitic Steel Reinforced with 3wt%TaC Processed by Powder Metallurgy

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Abstract:

This work presents the processing and characterization of two different metallic matrix composites, ferritic and austenitic steels, reinforced with 3wt %TaC nano structured by route of powder metallurgy.

This work developed, through powder metallurgy a new sintered materials. Austenitic stainless steel and ferritic steel both with tantalum carbide (TaC) addition. Powder metallurgy is an appropriate technique for the fabrication of composite materials.

Stainless steel is a widely accepted material because of high corrosion resistance. However stainless steels have poor sinterability and poor wear resistance due to their low hardness. Metal matrix composite (MMC) combining soft metallic matrix reinforced with carbides or oxides has attracted considerable attention for researchers to improve density and hardness in the bulk material¹

Ferritic stainless steels have been used in automotive exhaust systems, containers, railway vehicle and other functional applications owing to good fabrication at low cost and good resistance to chloride stress-corrosion cracking, atmospheric corrosion and also oxidation.²

This paper presents the processing and characterization of two different metallic matrix composites, ferritic and austenitic steels, reinforced with 3wt%TaC nano structured by route of powder metallurgy. The starting powders were characterized by X-ray diffraction and scanning electron microscopy. The samples were compacted in a cylindrical steel die ($\Phi = 5$ mm) at pressure of 700 MPa and sintered in vacuum furnace at 1290°C/60min. The sintered samples were characterized by optical (Fig01) and scanning electron microscopy. The preliminary results of the sintered samples showed that mechanical properties of MMC were influenced by the morphology and distribution of carbide in the alloys.

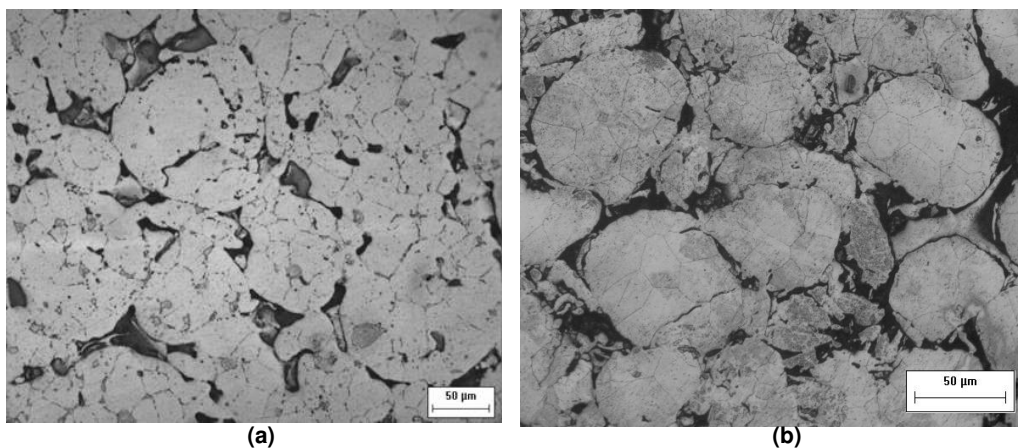


Figure 01: OM of sintered samples, 60 min. (a) austenitic steel + TaC (500x) and (b) ferritic steel + TaC (200x).

[1] Gomes, U. U.; Oliveira, L. A.; Soares, S. R. S.; Furukava, M.; and Souza, C.P. Effect Of The Dispersion Of Nanosized Carbides (NbC - TaC) In The Sintered Microstructure Of The Stainless Steel 316L. Materials Science 2008.

[2] Warmelo MV, Nolan D, Norrish J. Mitigation of sensitization effects in unstabilised 12% Cr ferritic stainless steel welds. Mater Sci Eng A 2007;464:157–69.