

Effect of tungsten carbide addition on the tribological behavior of Astaloy 85Mo powder consolidated via spark plasma sintering

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Astaloy85Mo; WC; spark plasma sintering, friction, wear

ABSTRACT

Hard particle additions in ferrous powders allow the production of sintered materials with higher toughness, hardness and wear resistance, with potential use in different applications [1-3]. This combination of properties is attained following correct mixture and sinterization procedures that result in the formation of composites with low porosity and adequate particle distribution (Fig. 1). In this work, Astaloy 85Mo ferrous powders were mixed with different WC additions (2, 5,7 and 10wt. %) by mechanical alloying (MA) and consolidated by spark plasma sintering (SPS), providing samples with higher real density, according to the rule of mixtures, and without increase in porosity (or apparent volume) [2,4]. SPS enhanced sinterability by using low sintering times that reduce carbon diffusion from WC to the ferrous matrix. Tribological evaluation was conducted by means of ball-on-disc tests with different loads (1, 5 and 10N). Specimens were in contact with a 100Cr6 ball with diameter equal to 6 mm diameter and the friction coefficient and wear volume were reported. Results indicated that an addition of 10 %wt of WC provided an increase (85%) in matrix hardness and that the higher amount of WC particles in the sliding contact contributed with higher load support and wear resistance (Fig. 2).

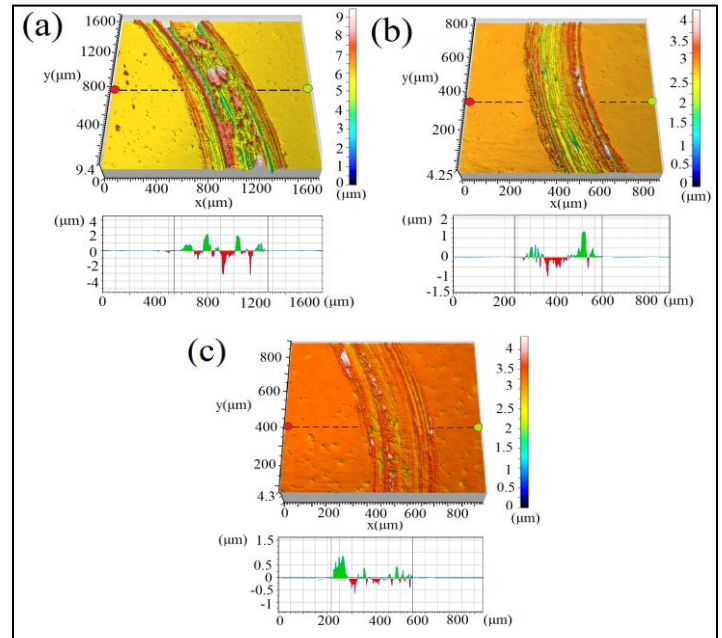


Fig. 2 Wear track profiles after ball-on-disc test using a load of 5N and sliding speed of 100cm/s for (a) Astaloy85Mo (b) Astaloy85Mo+5%wtWC and (c) Astaloy85Mo+10%wt WC

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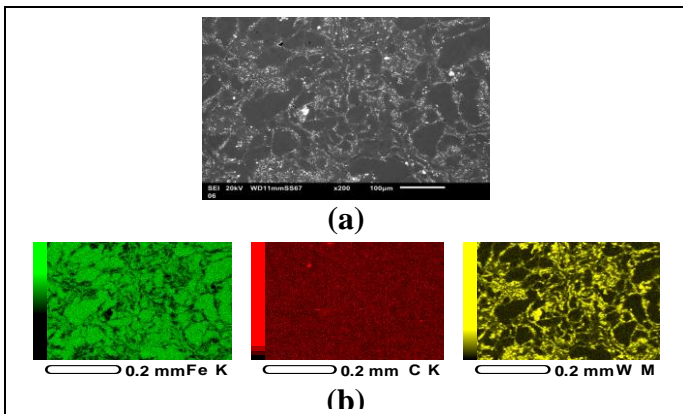


Fig. 1 Microstructure of Astaloy85Mo+10%wt WC powder mixture (a) MEV image and (b) EDS mapping.