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Title : EFFECT OF SURFACE ATTRITION ON THE MICROSTRUCTURE AND WEAR PROPERTIES OF BORONIZED GRADE 304 STAINLESS STEEL

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Grade 304 stainless steel has an excellent strength to weight ratio and high corrosion resistance; unfortunately it possesses very poor wear resistance. The structure of this type of stainless steel is austenitic and cannot be heat treated. This study focused on the effect of surface attrition using the shot blasting method on the surface of boronized grade 304 stainless steel. Boronizing was conducted at temperatures of 850˚C and 950˚C under two types of mediums which were powder and paste for the duration of 8 hours holding time. Boronized samples with thicker boride layer and superior wear properties were thus selected to undergo surface attrition using shot blasting method. The microstructure analysis and boride layer thickness were observed using optical microscopy, scanning electron microscopy (SEM) analyzer and energy dispersive X-Ray (EDX) spectrometry. Other tests such as pin on disc, erosion, microhardness, surface roughness and density were also conducted. Application of surface attrition on the surface of Pa-SB850 sample resulted in the formation of thicker boride layer with the thickness of 120 µm, an improvement of almost three times as compared to Pa-B850 sample with thickness of 43 µm. The microhardness result indicated the enhancement of approximately six times to the value of 1800 Hv compared to as received grade 304 stainless steel samples with the value of 261 Hv. The wear resistance of Pa-SB850 sample improved more than twice in term of COF value of 0.353 as compared to the SS sample with the COF value of 0.856. The erosion wear of Pa-B850 also improved two times compared to Pa-B850 sample with weight loss of 0.0512 g and 0.0911 g respectively at 16 hours erosion time. The implementation of surface attrition treatment resulted in grain refinements that allowed deeper boride layer to be diffuse into the surface of as received grade 304 stainless steel. The developed method makes it possible to implement boronizing in stainless steel which leads to improvement of properties such as hardness and wear resistance.