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Effect of molybdenum and niobium on the wear behaviour of high chromium white cast iron

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Abstract: High chromium white cast irons are excellent wearable materials. Their wear resistance is due to the presence of high volume fraction of hard carbides in microstructure. Accordingly, this material is very suitable for many applications such as mineral processing, cement production and other industrial fields. Researchers have tried different alloying elements in order to improve wear resistance of this material. An investigation was conducted to determine the effect of alloying elements on the friction and wear behaviour of high chromium cast iron with various concentrations of molybdenum and niobium. The alloys used in this work were made in industrial induction furnace. Alloying elements were added in crucibles after pouring operation. Amounts of molybdenum and niobium were varied between 0 and 3%. A molybdenum and niobium combination of an amount of 0.5% was also studied in this work. Wear investigations were carried out on the as cast and heat treated state of a slightly hypoeutectic high chromium cast iron.Results showed that the studied alloy is composed of netted eutectic chromium carbides embedded in an austenitic matrix. Wear looses carried out on as cast and heat treated cast irons indicates that the best results were obtained by abrasion with 3% Mo alloy. Friction tests has also given good results but less important. Manganese comparing to niobium addition has much more facilitated the abrasion than the friction resistance. These results indicate that the alloying elements do not act similarly on the two type of studied wear.

Keywords : high chromium cast iron, microstructure, wear, friction, carbide