

Wear and Mechanical Properties of Nodular Iron Modified with Copper

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Abstract : The nodular iron is a material that has shown great advantages respect to other materials (steel and gray iron) in the production of machine elements. The engineering industry, especially automobile, are potential users of this material. As it is known, the alloying elements modify the properties of steels and castings. Copper has been investigated as a structural modifier of nodular iron, but studies of its mechanical and tribological implications still need to be addressed for industrial use. With the aim of improving the mechanical properties of nodular iron, alloying elements (Mn, Si, and Cu) are added in order to increase their pearlite (or ferrite) structure according to the percentage of the alloying element. In this research (using induction furnace process) nodular iron with three different percentages of copper (residual, 0,5% and 1,2%) was obtained. Chemical analysis was performed by optical emission spectrometry and microstructures were characterized by Optical Microscopy (ASTM E3) and Scanning Electron Microscopy (SEM). The study of mechanical behavior was carried out in a mechanical test machine (ASTM E8) and a Pin on disk tribometer (ASTM G99) was used to assess wear resistance. It is observed that copper increases the pearlite structure improving the wear behavior; tension behavior. This improvement is observed in higher proportion with 0,5% due to the fact that too much increase of pearlite leads to ductility loss.

Keywords : copper, mechanical properties, nodular iron, pearlite structure, wear

Conference Title : ICMSCMP 2015 : International Conference on Material Science and Condensed Matter Physics

Conference Location : Prague, Czechia

Conference Dates : March 23-24, 2015