

Effect of Cryogenic Treatment on Various Mechanical and Metallurgical Properties of Different Material: A Review

Authors : Prashant Dhiman, Viranshu Kumar, Pradeep Joshi

Abstract : Lot of research is going on to study the effect of cryogenic treatment on materials. Cryogenic treatment is a heat treatment process which is used widely to enhance the mechanical and metallurgical properties of various materials whether the material is ferrous or non ferrous. In almost all ferrous metals, it is found that retained austenite is converted into martensite. Generally deep cryogenic treatment is done using liquid nitrogen having temperature of -195 °C. The austenite is unstable at this stage and converts into martensite. In non ferrous materials there presents a microcavity and under the action of stress it becomes crack. When this crack propagates, fracture takes place. As the metal contract under low temperature, by doing cryogenic treatment these microcavities will be filled hence increases the soundness of the material. Properties which are enhanced by cryogenic treatment of both ferrous and non ferrous materials are hardness, tensile strength, wear rate, electrical and thermal conductivity, and others. Also there is decrease in residual stress. A large number of manufacturing process (EDM, CNC etc.) are using cryogenic treatment on different tools or workpiece to reduce their wear. In this Review paper the use of cryogenic heat treatment in different manufacturing has been shown along with their advantages.

Keywords : cryogenic treatment, EDM (Electrical Discharge Machining), CNC (Computer Numeric Control), Mechanical and Metallurgical Properties

Conference Title : ICSRD 2020 : International Conference on Scientific Research and Development

Conference Location : Chicago, United States

Conference Dates : December 12-13, 2020