A New Quenching Method to Improve the Mechanical Properties of Metals

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Abstract:

The effectiveness of acid solutions as a quenching agent for medium carbon steel and 5083-H22 aluminium alloy was investigated in this work. The samples were quenched in different acidic solutions. Solution A consists of 99% water +1% HCl, solution B consists of 97% water +3% HCl and solution C consists of 95% water +5% HCl. Thermal camera of type FLIR T600 was used to calculate the heat transfer time between the samples and the media. The microstruc-tural characteristics of the quenched specimens were examined with an optical microscope. The mechanical properties such as yield strength, tensile strength, elongation and hardness were obtained by the conventional method. The results reveal that the samples quenched in solutions B and C show a significant increase in terms of strength compared to samples quenched in water. The accelerated cooling in solutions B and C has a double advantage which leads to an increase in the strength of the steel without a great degradation of the deformation properties, and that's what all mechanical engineers aspire. The obtained results on 5083-H22 aluminium alloy confirm the superiority of solutions B and C over water as a quenching agent in terms of strength, hardness and elongation.

Keywords:

Quenching; cooling rate;acidic quenching; mechanicalproperties; medium carbonsteel; 5083-H22 aluminium