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Experimental studies to find the weight loss and changes in microstructure of stressed mild steel immersed in apple juice for a prolonged time

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Abstract

The authors conducted experiments to find the weight loss and changes in microstructure of stressed mild steel immersed in apple juice for a prolonged time. Mild steel samples and their stresses were induced by heat treatment at various austenitic temperatures of 800 850 and 900⁰c followed by rapid quenching in cold water. Their analysis indicated that the samples heat treated at 800⁰c were more resistant in apple juice having the lowest corrosion rate. Inter granular corrosion with traces of pitting was observed in the heat treated samples immersed in apple juice and the acidity of medium increased with increasing in exposed time. The authors have explained in the paper the mechanism of corrosion, the process of stress corrosion cracking, the process of heat treatment, selection and preparation of samples, description of weight loss measuring equipment, equipment used for microstructure studied etc. They have also established equations for calculating corrosion rates. The following are major conclusions drawn by the authors. The corrosion behavior of pre-stressed mild steel immersed in apple juice was investigated in this study by weight loss measurement and microstructural analysis. The analysis of the results obtained showed that the water quenched mild steel samples showed significant changes in their microstructures. The mild steel heat treated at 800⁰c was found to be more corrosion resistant with an average corrosion rate of 53.23_{μm/y} than all other samples which had successively, 65.05_{μm/y} for the 850⁰c heat treated, 80.62_{μm/y} for the 900c heat treated, and 99.84_{μm/y} for the non-heat treated mild steel samples. Thus these results indicate that heat treatment of this steel samples increased their corrosion resistance in apple juice.