

AN ALTERNATIVE METAL FOR STAINLESS STEEL USED IN FOOD INDUSTRY

ABDALWAHID K. BAKRI¹, KADHIM F. ALSULTAN² & SARA K. NAIF³

¹Professor, College of Material Engineering, Babylon University, Babylon, Iraq

²Assistant Professor, College of Material Engineering, Babylon University, Babylon, Iraq

³Assistant Lecture, College of Material Engineering, Babylon University, Babylon, Iraq

ABSTRACT

The present research represents as an attempt to control corrosion rate of alloys, mainly stainless steel used in food industry. One way of controlling the corrosion rate, i.e. enhancing the effective life of this component is to alter all the factors affecting this rate.

However, the other way of enhancing the useful life is probably to find an alternative cheaper, nontoxic and available alternative. Results of this work proved that stainless iron can be used as a successful alternative for stainless steel used in food industry.

Tafel extrapolation corrosion test of these alloys in formic acid strongly supported this point.

Simple immersion corrosion test in formic acid of concentrations (20, 40 and 60% v/v) showed that corrosion rate of stainless iron was lower than stainless steel in several cases. If it was not so in certain tests then, it was found that heat treatment of stainless iron at (100°C) for (2 hrs) before corrosion test eliminate completely the difference in corrosion rate between them, and make the corrosion behavior of stainless iron even better. This treatment make stainless iron caused an increase of (800%) corrosion rate. Both stainless iron and stainless steel reached, in general, to a steady state after certain periods of time. A significant difference in corrosion rate between stainless iron and stainless steel was observed. For example an improvements in corrosion rate of (240% and 2100%) was found in formic acid at room temperature without preheating.

However, it's believed that, prior heat treatment of stainless iron enhanced the diffusivity of chromium atoms responsible of building the protective layer of (Cr₂O₃).

This why the preheating of this alloy during this work proved to be effective in accelerating the formation of chromia layer (Cr₂O₃). The reduction of corrosion rate of stainless iron reflected this result and even makes it lower than the corresponding value of stainless steel. It appears that even an increase of temperature from (40 to 65°C) caused a further reduction in corrosion rate of stainless iron compared to that of stainless steel in formic acid.

KEYWORDS: Corrosion Effect, Stainless Steels, Used in Food Industry