Title	Electrochemical behaviour of some commercial stainless steel alloys in Simulated Body Fluid electrolytes,
Authors	A. Bahrawy, Mohamed El-Rabiei, Hesham Elfiky, Nady Elsayed, Mohammed Arafa, **Mosaad Negem**
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Abstract

Purpose – The commercial stainless steels have been used extensively in the biomedicine application and their electrochemical behaviour in the simulated body fluid (SBF) are not uncovered obviously. In this research, the corrosion resistance of the commercial stainless steel of Fe–17Cr–xNi alloys (x = 4, 8, 10 and 14) has been studied. This study aims to evaluate the rate of corrosion and corrosion resistance of some Fe–Cr–Ni alloys in SBF at 37°C.

Design/methodology/approach – In this research, the corrosion resistance of the commercial stainless steel of Fe–17Cr–xNi alloys has been studied using open circuit potential, electrochemical impedance spectroscopy and potentiodynamic polarization in the SBF at 37°C and pH 7.4 for a week. Also, the surface morphology of the four alloys was investigated using scanning electron microscopy, elemental composition was obtained via energy dispersive spectroscopy and the crystal lattice structure of Fe–17Cr–xNi alloys was obtained using X-ray diffraction technique. The chemical structure of the protective oxide film has been examined by X-ray photoelectron spectroscopy (XPS) and metals ions released into the solution have been detected after different immersion time using atomic absorption spectroscopy.

Findings – The results revealed that the increase of the Ni content leads to the formation of the stable protective film on the alloys such as the Fe– 17Cr–10Ni and Fe–17Cr–14Ni alloys which possess solid solution properties. The Fe–17Cr–14Ni alloy displayed highest resistance of corrosion, notable resistance for localized corrosion and the low corrosion rate in SBF because of the formation of a homogenously protective oxide film on the surface. The XPS analysis showed that the elemental Fe, Cr and Ni react with the electrolyte medium and the passive film is mainly composed of Cr_2O_3 with some amounts of Fe(II) hydroxide at pH 7.4.

Originality/value – This work includes important investigation to use commercial stainless steel alloys for biomedical application.