# البحث الثالث

## Assessment of $H_2O_2$/albumin and glucose on the biomedical iron alloys corrosion in simulated body fluid: Experimental, surface, and computational investigations


## Abstract

The strong mechanical property and biocompatibility of iron and its alloys are commonly employed as implant materials. Herein, the impact of H2O2/albumin & glucose on the corrosion performance of Fe-14Cr-8Mn and Fe–14Cr–8Ni, as biomedical alloys in simulated body fluid (SBF) was examined via electrochemical tests. The corrosion appearance was observed via SEM micrographs, EDX, and XPS spectrum. The correlation was formed between the gained corrosion rate from electrochemical measurements and certain quantum chemical parameters. Electrochemical testing indicates that albumin adsorption accelerates anodic degradation and suppressed cathodic reaction, for both Fe-14Cr-8Mn and Fe–14Cr–8Ni alloys, while the cathodic reaction was increased by $H_2O_2$. $H_2O_2$ or albumin also enhanced meta-stable/ stable pitting corrosion and reduced charge transfer resistance. The results indicate that both of Fe-14Cr-8Mn and Fe–14Cr–8Ni alloys demonstrate steady behavior even in high corrosion medium but Fe-14Cr-8Mn displays the highest corrosion resistance in the presence of H2O2/albumin and when the glucose concentration was 100 ppm with simulated body fluid. The results prove that the implant Fe-14 Cr-8Mn alloy can perform an effective part in fluids with extremely low glucose levels because their passive film-penetrated to the material surface prematurely. The surface morphology assessed for these samples, which changes from a uniform anisotropic Fe–14Cr–8Ni to a uniform isotropic Fe–14Cr–8Mn alloy mode in SBF with H2O2/albumin. The obtained results from the electrochemical, surface, and computational investigations have a strong approach.



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