A Mixed Copper Corrosion Inhibition Effect of Potassium Sorbate and Benzotriazole

D. Gelman [1], **D. Starosvetsky** [2], **and Y. Ein-Eli** [1,2]

Department of Materials Science and Engineering, Technion and Grand Technion Energy Program, Technion- Israel Institute of Technology, Haifa, Israel
gelmand@tx.technion.ac.il
Department of Materials Science and Engineering, Technion- Israel Institute of Technology, Haifa, Israel

Copper and copper alloys have been used from prehistoric times, and their present day importance is greater than ever before. Copper is one of the most important nonferrous materials, it is frequently used in water systems such as water distribution networks and cooling systems. The long term operation of Cu-based equipment which is in contact with aqueous media depends to a large extent on the corrosion resistance characteristics of the passive film that covers the Cu surface. The Cu passive film is usually a duplex structure of oxides with an inner cuprous oxide and an outer cupric oxide and hydroxide. In aqueous solutions containing chlorides and sulfates this passive film provides relatively low corrosion protection. An effective way to improve corrosion resistance of Cu surfaces is the use of inhibitor protection.
This work presents the Combined effect of two inhibitors - potassium sorbate (2,4-hexadienoic acid potassium salt, $KCH_3CH=CHCH=CHCO_2$) and 1,2,3-benzotriazole ($C_6H_5N_3$) - on copper corrosion behavior in a sulfate solution. Electrochemical measurements were conducted via potentiodynamic and potentiostatic polarizations. The effect of inhibitor content on copper protection was examined. It was established that the mixture of potassium sorbate (K-sorbate) and Benzotriazole (BTAH) provides strong corrosion protection of copper in a wide potential range of up to $1V_{SCE}$ in sulfate solutions. Without K-sorbate, BTAH alone protects the copper surface from corrosion attack in the sulfate solution only at a potential range which is below $0.4V_{SCE}$, at potentials above $0.4V_{SCE}$ the copper surface undergoes strong corrosion attack. In the potential range below $0.4V_{SCE}$ the mixture of both inhibitors provides Cu corrosion protection more effectively than that the K-sorbate without BTAH.

Key Words: Copper Corrosion, Inhibitors ,Potassium Sorbate, Benzotriazole.