

Abstract

COPPER CORROSION INHIBITORS IN CHLORIDE ENVIRONMENTS

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Abstract

Due to the widespread use of copper, electrochemical investigation of copper in various environments is highly important. Although copper is resistant to atmospheric effects and many chemicals, it remains susceptible to corrosion in aggressive environments. Corrosion of copper in chloride-containing environments poses a significant problem in industry and material protection, as chloride ions destabilize the protective oxide layer and accelerate metal degradation. In solutions such as NaCl, electrochemical reactions occur involving the anodic oxidation of copper and the cathodic reduction of oxygen, with the presence of chloride ions significantly increasing the corrosion rate [1,2]. One of the most effective ways to protect copper is through the use of corrosion inhibitors. Inhibitors are substances added in small quantities and can be defined as chemical substances or combinations of substances that, when present in an appropriate concentration and form, prevent or reduce the corrosion process. The most commonly used inhibitors are organic compounds, especially azoles, imidazoles, and thiadiazoles. These substances contain heteroatoms such as nitrogen, sulfur, and oxygen, which enable their adsorption onto the copper surface and the formation of a stable protective film. Compared to other methods, inhibitors are easy to apply and can be used independently or in combination with protective coatings [3].

Green inhibitors are a group of compounds of animal or plant origin. In addition to being biodegradable, they do not contain heavy metals, making them environmentally friendly [1].

Aloe vera is a natural green corrosion inhibitor known for its wide range of applications. This spiny plant belongs to the cactus family and includes more than 500 species, most of which live in desert climates. It is used as an antibacterial and antifungal agent because it inhibits the activity of microorganisms. It also exhibits corrosion-resistant properties, as it affects the activity of microbial biofilms and leads to a lower rate of biocorrosion in corrosive environments. Aloe vera contains various active substances such as aromatic acids, polysaccharides, and certain minerals. The gelatinous substance found in its leaves is particularly effective in preventing copper corrosion. These components contribute to aloe vera's ability to form a protective layer on the metal surface, thereby preventing corrosion [2].

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REFERENCES

1. Grekulović, V., Štrbac, N., Mitovski, A. *Ecologica*. 2021, 28(102), 309–314.
2. Mahmoud, G.A., Abdel-karim, A.M., Saleh, S.M., *et al.* *J. Alloy Compd.* 2025, 1010, 177540.
3. Petrović Mihajlović, M.B., Antonijević, M.M. *Int. J. Electrochem. Sci.* 2015, 10(2), 1027–1053.