Full Paper _____ *Thematic Section:* Research into New Technologies.
The Reference Object Identifier – ROI: jbc-01/19-60-12-70 *Subsection:* Corrosion Protection Technology.
The Digital Object Identifier – DOI: 10.37952/ROI-jbc-01/19-60-12-70
Submitted on December 26, 2019.

Biological testing of aqueous-based metal preservation technologies

© **Renata S. Krymskaya**,[1]*+ **Ekaterina I. Plaskeeva**,[2] and **Svetlana E. Bogdanova**[3]
Department of Chemistry. St. Petersburg State Marine Technical University.
Lotsmanskaya St., 3, St. Petersburg, 190121. Russia.
Phone: [1)] *+7 (921) 091-84-84;* [2)] *+7 (999) 519-66-57;* [3)] *+7 (921) 316-55-21.*
E-mail: [1)] *rysionok@mail.ru ;* [2)] *ekaterina.plaskeeva@list.ru ;* [3)] *sbogdanova1@yandex.ru*

*Supervising author; +Corresponding author

***Keywords*:** preservation methods, corrosion inhibitors, preservation layer thickness, Arctic weather conditions, determination of environmentally safe concentrations, bio-testing of preservation solutions.

Abstract

This paper deals with an essential issue of safe methods for temporary metal products protection against corrosion. Nowadays, there are a lot of corrosion inhibitors available; however, most of them are based on chemically hazardous derivatives of amines, nitrites, and chromates contained therein. The listed substances negatively affect both people and the environment. In Arctic weather conditions it is especially important to have reliable and safe anti-corrosion systems that can be applied in marine equipment preservation technologies. It is extremely undesirable to make any repairs and painting works under Arctic conditions, any restoration paintwork of metal items, as well as number of unpainted metal items to be protected must be minimized. The safest preservation methods are aqueous solutions; with such solutions, metal structures to be protected in Arctic conditions either do not need any preparatory preserving agent washing off, or washing off is ultimately simplified. This paper presents wide-spread inhibitors and inhibitors synthesized from safe natural fatty acids of vegetable oils. The article considers their characteristics and applicability. Also, the paper determines environmental hazard classes of aqueous preservation solutions by using biological testing objects. It allows us to assess a hazard level of the applied preservation method, regardless of how substances or combination thereof cause changes in vital functions of the testing objects. Based on the experiments conducted, the article discusses a possibility of using low-hazard preservation methods.

References

[1] I.L. Rosenfeld. Corrosion Inhibitors. *Moscow: Chemistry Publishing House*. **1977**. 150p. (russian)
[2] R.S. Krymskaya, V.I. Trusov, E.I. Plaskeeva. Corrosion Inhibitor for Temporary Protection of Ship Systems and Equipment *Marine Intelligent Technology*. **2019**. No.2(44). Vol.1. P.107-110. (russian)
[3] Yu.A. Smyatskaya. Toxicity assessment of residual biomass of microalgae Chlorella sorokiniana. *Butlerov Communications.* **2019**. Vol.59. No.7. P.92-98. DOI: 10.37952/ROI-jbc-01/19-59-7-92
[4] D.V. Budina, T.Ya. Ashikhmina, and A.S. Olkova. Toxic effects' analysis of water extracts of polyvinylchloride compounds. *Butlerov Communications.* **2017**. Vol.50. No.6. P.112-118. DOI: 10.37952/ROI-jbc-01/17-50-6-112
[5] V.A Terekhova. Soil Bio-Testing: Approaches and Problems. *Soil Science*. **2011**. No.2. P.190-198. (russian)
[6] Bio-Testing as a Modern Method for Assessing Natural and Waste Waters Toxicity: Monograph. *Nizhnevartovsk: Publishing House of Nizhnevartovsk State University.* **2013**. P.119. (russian)
[7] Biological Environmental Control: Bio-Indication and Bio-Testing. Ed. O.P. Melekhova, E.I. Egorova. *Moscow: Academy Publishing Center*. **2010**. P.288. (russian)
[8] Algae (Chlorella vulgaris Beijer) Optical Density Measuring Method to determine toxicity of drinking, fresh natural and waste water, water extracts from soils, sewage sludge, production and consumption waste PND F T 14.1:2:3:4.10-04/T 16.1:2:2.3:3.7-04. *Moscow*. **2014**. (russian)
[9] Quantity Measuring Method (Daphnia magma Straus) to determine acute toxicity of drinking, fresh natural and waste water, water extracts from soils, sewage sludge, production and consumption wastes by direct calculation PND F T 14.1:2:3:4.12-06/ T 16.1:2:2.3:3.9-06. *Moscow.* **2014**. (russian)
[10] R.S. Krymskaya, V.I. Trusov, A.I. Altsybeeva, T.M. Kuzinova. N-M-1Corrosion Inhibitor. *Corrosion: Materials, Protection.* **2011**. No.9. P.32 -35. (russian)

[11] V.I. Trusov, E.A. Bezrodnykh, E.A. Nazarov, S.A. Lebedeva. Corrosion Inhibitor with Chlorophyll Copper Derivatives. *Corrosion: Materials, Protection.* **2004**. No.10. P.29-30. (russian)
[12] R.S. Krymskaya, I.V. Garmashova, E.N. Ananyeva, V.I. Trusov. Special Features of Atmospheric Corrosion Inhibitors Fungistatic Activity in Relation to Mold Fungi. Natural and Technical Sciences. ISSN 1684-2626. **2011**. No.6(56). P.323-328. (russian)