

ANTI-CORROSIVE PROPERTIES OF THE GUANIDINE-CONTAINING OLIGOMER WITH ALKYL RADICAL

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Recently, corrosion, especially microbiologically influenced corrosion (biocorrosion), is one of the problem in building construction and oil and gas industry. Annual losses from corrosion reach 3-6% of Gross Domestic Product (GDP) of countries. This problem demand the search of effective methods of protection and use of new inhibitors which are one of the promising and economically preferable. Guanidinium oligomers are a poorly studied class of organic compounds that attract attention due to their antimicrobial properties. Such compounds are perspective for use as a microbial corrosion inhibitor.

To study anticorrosive properties of newly-synthesized guanidinium oligomer DEG-2 with C₁₀H₂₁Br₂ alkyl radical (compound was obtained at the Institute of Macromolecular Chemistry, NAS of Ukraine) collection SRB cultures *Desulfovibrio* sp. 10, *D. desulfuricans* DSM642, *D. vulgaris* DSM644 from UCM of D.K. Zabolotny Institute of Microbiology and Virology NAS of Ukraine were used. To evaluate the efficacy of the studied compound, such inhibitors as DPC (N-decyl pyridinium chloride – quaternary ammonium compound (National Technical University of Ukraine “Igor Sikorsky Kyiv Polytechnic Institute”, Ukraine) and Armohib CI-28 (Diamine Ethoxylate) (Akzonobel, Holland) were used for comparance. In liquid Postgate “B” nutrient media inoculated with SRB cultures previously treated steel coupons and inhibitors in concentrations - DPC (1 g/L), Armohib CI-28 (5 mL/L) and guanidinium oligomer (5 g/L) were added. As a control Postgate “B” media with coupons and inoculated with SRB as well as sterile media without inhibitors were used. Exposure period was 30 days at 28°C. The inhibitor’s efficacy was estimated according to such indicators as bacterial titer change, the corrosion rate and degree of metal protection (Z).

The titer of three strains of SRB in control variants without inhibitors was in range 1·10⁷ - 4·10⁸ cells/mL. During the cultivation of bacteria with DPC bacterial amount of *D. desulfuricans* DSM642 strain was decreased to dozens cells per mL, and no growth for other two stains was observed. The adding of Armohib CI-28 led to decreasing of SRB titers to 3.4·10⁶ – 3.7·10⁷ cells/mL (by 1-2 orders). Similarly to DPC, in the presence of the guanidinium oligomer with alkyl radical only dozens of cells were observed. Thus, efficacy of biocidal properties of DPC, Armohib CI-28 and newly-synthesized guanidinium oligomer were 99.99-100%, 63.0-95.89% and 99.99%, respectively. The determined rate of steel corrosion in control variants with SRB and without inhibitors were 0.21 – 0.35 mg/cm²·hour. The adding of DPC decreased corrosion rate to 0.032 – 0.046 mg/cm²·hour for all three SRB strains and adding of Armohib CI-28 decreased corrosion rate to 0.027 – 0.039 mg/cm²·hour. The rate of steel corrosion with guanidinium oligomer for three SRB strains were 0.075-0.079 mg/cm²·hour. According to weight loss of steel coupons the degree of metal protection (Z) were for DPC- 84.54 – 90.46%, for Armohib CI-28 – 75.96 – 92.0%, and for guanidinium oligomer were lower (60.15-63.17%).

The data shows that newly synthesized guanidinium oligomer with alkyl radical possess not only biocide properties, but anticorrosive as well. This compound is new-promising for usage as anticorrosive agent to fight with microbiologically influenced corrosion.

