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«Problems of corrosion and corrosion protection of materials» (Corrosion-2020)

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ABSTRACT BOOK

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XV International Conference "Problems of Corrosion and Corrosion Protection of Materials" (Corrosion-2020) was held at Lviv Palace of Arts on October 15-16, 2020. This Book of Abstract contains the results of studies are devoted to fundamentals of corrosion and corrosion assisted mechanical fracture; hydrogen and gas corrosion; new corrosion resistant materials; thermal spray, electroplated and other coatings; inhibitor, biocidal and electrochemical protection; testing methods and corrosion control; corrosion protection of oil and gas industry and chemical equipment.

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CONFERENCE TOPICS:

- fundamentals of corrosion and corrosion assisted mechanical fracture;
- hydrogen and gas corrosion;
- new corrosion resistant materials and coatings;
- inhibitor and biocidal protection;
- electrochemical protection;
- testing methods and corrosion control;
- corrosion protected equipment of the oil and gas, chemical and energy industries.

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POLYMER-MAGNETITE THERMOSETTING COMPOSITES WITH PROTECTIVE AND ANTIRADAR FUNCTIONS

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Composite materials containing dielectric or semiconductor nanoparticles of a particular shape as well as periodical micro- and nanostructures capable of spatial redistribution of scattered electromagnetic radiation in desired directions are perspective for that task. The goal of our present work is fabrication of hybrid polymer-inorganic composite coating with antiradar and anticorrosive properties. Iron oxides, magnetite or Fe_3O_4 in particular are especially interesting among other components due to their ability to absorb electromagnetic waves of near IR and microwaves ranges [1]. Carbon threads or carbon nanotubes inclusions in magnetite-based composites may provide a synergetic effect, i.e. enhance electromagnetic energy absorption and improve anticorrosive properties on metal surface. We suggest exploring organic compounds based on conductive conjugated polymers along with magnetite immersed into epoxy resin matrix as an effective coating [2]. Dispersed magnetite Fe_3O_4 in a form of spherical particles with the diameter of 1.2 -2 μm capable of not only absorb but also scatter electromagnetic radiation served as magnetic filler for composites. The magnetite colloidal dispersion was stabilized via surfactants that results in the formation of self-assembled molecular aggregates and provides overall stability of the system [3]. Prepared polymer composites were characterized by X-ray and EDAX-analysis, Raman spectroscopy, thermogravimetric, mechanical and thermo-mechanical techniques. Variation in the size of Fe_3O_4 particles and their concentration in the composites does not affect the period of elementary cell of magnetite and has a complex effect on the magnetic susceptibility, microhardness and thermomechanical properties of magnetite–polymer composite. It was found that composite containing magnetic microparticles and particles of polyaniline doped with sulfuric acid in 1:1 ratio exhibits the strongest microwave absorption. At the same time this optimal composition provides high microhardness and anticorrosive properties of the coating on the surface of steel. The value of the relative water absorption of the composite coatings during 30 days of exposure in a moist chamber with a humidity of 95% turned out to be half as much compared to an unfilled epoxy composition. The electrochemical potential of the coated steel surface based on the developed thermosetting composition showed a significant anode shift (by 0.3-0.4 V), while the surface state of the coatings remained unchanged. The obtained results confirmed the sufficient corrosion resistance of the coatings in comparison with the known analogues [4]. On the basis of obtained results method of composite formation with special purpose would be developed.

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