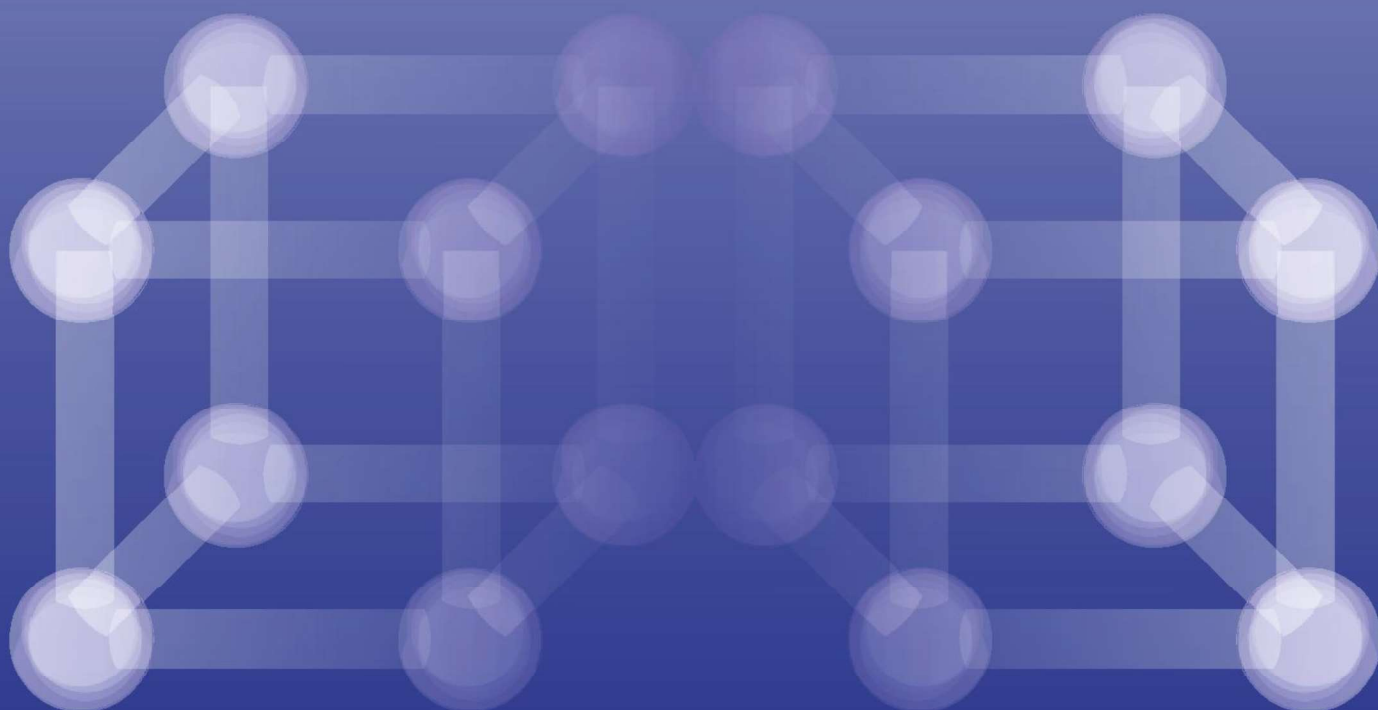


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Increase in Wear Resistance of Composite Coatings Nickel–Phosphorus–Modified Copper Phthalocyanate

Kirill V. Zuev,¹ Evgeny G. Vinokurov,^{1, 2} Aslan Yu. Tsivadze,^{2, 3} Valery P. Perevalov¹

¹ D. Mendeleev University of Chemical Technology, Russia, zuev.kirill@inbox.ru

² Frumkin Institute of Physical Chemistry and Electrochemistry, Russian Academy of Sciences, Russia

³ Kurnakov Institute of General and Inorganic Chemistry, Russian Academy of Sciences, Russia

Loss of energy during friction and wear is a large problem in the operation of actuated parts of most mechanisms. An alternative to the use of conventional liquid, plastic, and solid lubricants may be represented by antifriction compositions, which are deposited on parts and friction units using chemical and electrochemical deposition.^{1, 2} Some phthalocyanine (Pc) derivatives possess necessary features of triboactive additives, in particular, structure-formation ability at an interface.³ However, when using water-insoluble phthalocyanines for the preparation of coatings, it is a problem to maintain their suspension stability in electrolyte solutions. To solve this problem, the modification

of Pc particles by reaction with 4-benzenediazonium-carboxylate are used.⁴ It was shown (Fig. 1a) that the electrokinetic (ζ -) potential of the particles in aqueous dispersions changes greatly (from -25 mV to -45 mV) as well as the average size aggregates reduces from ~3000 nm to ~250 nm. This provided the significant increase of colloidal stability of Pc aqueous suspensions. The introduction of additives of the

disperse phase of modified (carboxylated) CuPc in an amount of 0.1–0.2 g/L into weakly acidic solutions for chemical deposition of the Ni-P alloy provides composition coatings with the wear resistance, which is increased by two to three times, under rubbing friction (Fig. 1b). The wear resistance of coatings increases with growth of the number of carboxyphenyl fragments in the modified CuPc

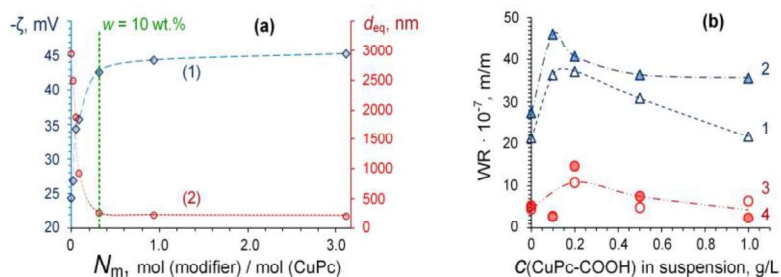


Figure 1. (a) ζ -potential of CuPc particles (1) and the mean diameter (d_{eq} , 2) of their aggregates in aqueous suspensions depending on the molar ratio modifier-CuPc. (b) Dependence of the wear resistance at the path length of (1, 3) ~0 and (2, 4) 1 km in the case of (1, 2) Ni-P-CuPc-coatings and (3, 4) tribocontact of the Ni-P-CuPc-coating/steel-45 on the concentration of CuPc-COOH

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