PROPERTIES OF ORGANIC COATINGS, DEPENDING ON THE STRUCTURE AND THE VOLUME CONCENTRATION OF PIGMENT

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Abstract

The use of pigments CaTiO₃ and TiO₂ in anticorrosion coatings for metal protection presents a new approach. High anticorrosion efficiency was identified in all the tested pigments, the highest efficiency being demonstrated in pigment CaTiO₃ pigment of perovskite structure.

Key words: perovskite, anatase, anticorrosion coating, anticorrosion pigment, paint

INTRODUCTION

The anticorrosion pigments working on a chemical principle are soluble to a certain extent and their ions are thus capable of interacting, at the interface of their particles, with the surface of a metal base, or with the functional groups of a binder during the drying of coating films. The anticorrosion pigments with electrochemical effects passivate a metal base material electrochemically. The primary particles of barrier pigments have a nonisometric particle structure and assume a position that is parallel to the base during the drying of the coating film.

METAL OXIDE-BASED PIGMENTS

This group comprises these three most significant oxides types: perovskite CaTiO₃ (Figure 1b), ilmenite FeTiO₃ and spinel FeAl₂O₄. In perovskite, the large ions of Ca²⁺ and O²⁻ together with a smaller Ti⁴⁺ cation that is individually placed in one of many gaps create a tightly arranged structure. Other double oxides with a perovskite structure are SrTiO₃ or CaZrO₃. In ilmenite, the O²⁻ anions are found in the tightest possible hexagonal layout in which both Fe²⁺ and Ti⁴⁺ individually occupy one third of octahedral gaps. Structurally more complex are spinels with the O²⁻ anions in the tightest possible cubic layout and with the M²⁺ cation occupying some of tetrahedral gaps, whereas the M³⁺ cations fill some of the octahedral gaps.

EXPERIMENTAL DETERMINATION OF THE CORROSION-INHIBITIVE EFFICIENCY OF THE TESTED PIGMENTS IN ORGANIC COATINGS

The properties of the anticorrosion pigments affect the efficiency of the coating film while protecting a metal base. Given the mechanism and chemism of their action, the pigments induce the creation of protective, passivating layers on a metal base and affect the pH values during corrosion anodic and cathodic reactions. By liberating cations from their lattice, the ion-active pigments neutralize or cause the ion exchange of the H⁺, Cl⁻, and SO₄²⁻ ions permeating from the outside corrosion environment. The individual factors in the outside environment that cause corrosion are simulated with the aid of laboratory tests in the mist of NaCl, SO₂ and condensed H₂O.

CONCLUSION

The research and development of nontoxic anticorrosion pigments that could fully replace toxic chromated pigments cannot be considered complete yet. Our study researched the anticorrosion properties of the paints that contained mixed metal oxides-based pigments TiO₂ and CaTiO₃. Laboratory tests proved that the pigments have a highly positive influence on the physical- mechanical properties of paints. The results of the accelerated corrosion test in the condenser chamber with general water condensation show that the most efficient pigment is CaTiO₃.
Literature


