

Nanocomposites and nanomaterials

Epoxy-silica nanocomposites and protective coatings based them

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One of the most progressive techniques of polymer properties modification is sol-gel technology which provides control of filler nanoparticle size during synthesis process. This method promotes more uniform distribution of forming particles into polymer matrix. Nanocomposites based on epoxy compounds and silicon alkoxides are often used as protective coatings for different nature surfaces and are of particular interest.

The aims of present investigation was to obtain transparent composites via amine curing of cycloaliphatic epoxy resin EPONEX 1510 and sol of silica particles, and to assess possibility of their use as protective coatings for aluminium alloys. Silica sol was obtained via hydrolytic polycondensation of tetraethoxysilane (TEOS) and 3-aminopropyltriethoxysilane (APTES) under their mole ratio 1:1. Amine curing agent Jeffamine T403 was used for curing of EPONEX 1510. The range of silica filler content was 0.5 – 3.0 wt.% reference to epoxy resin mass in composites.

It was determined that use of silica filler based on TEOS and APTES in reported range of concentration increases resistance of epoxy-amine polymer to thermal oxidative destruction: maximal rate of oxidation process under high temperatures is decreased, temperature of maximal rate of mass loss (derivatographic analysis) is shifted to the side of higher value.

It was established that coatings on the basis of obtained epoxy-silica composites have good adhesion to metallic surfaces. Herewith content of silica filler and pathway of epoxy resin curing influence on coatings resistance to longterm effect of salt solutions. Investigation of anticorrosion properties of composite coatings on surface of D16 aluminium alloy by electro-chemical technique was shown decreasing of corrosion current density of substrate on one-two orders, and efficiency corrosion protection of alloy depends on filler content in the system and on pathway of epoxy resin curing and in some cases reaches 98%.