

Nanotechnology and nanomaterials

Epoxy nanocomposites with increased exploitation characteristics and technical and economical indicators

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Today the range of use of polymer nanocomposites can be expanded by reinforcing their epoxy binder with nanodisperse particles. Special attention is paid to the technology of reinforcing the epoxy binder with nanoparticles that allows getting materials with improved exploitation characteristics.

The epoxy diene oligomer ED-20 grade (GOST 10587-84), polyethylene polyamine hardener (PEPA) (TU 6-05-241-202-78), nanoparticle filler of sintered composite (NFSC) with a size 5 ... 8 nm were used to form the nanocomposite materials. The technology of forming the nanocomposite is given in the paper [1].

NMR-spectral, X-ray fluorescence and quantitative chemical analyzes were used for determination of NFSC. The chemical composition of nanofiller elements was determined as following: calcium carbonate (CaCO_3) – 47,46%, carbon (graphite, soot) – 11,27%, potassium carbonate (K_2CO_3) – 37,97%, potassium chloride (KCl) – 3,29% .

The adhesive and cohesive properties of the composites were investigated depending on the content of NFSC ranging $q = 0,010 \dots 0,100$ wt %. The optimum filler content in the composite was determined, which is $q = 0,050$ wt % on each 100 wt % of oligomer ED-20. With such filling the material is formed with the following indicators of properties: adhesive strength in isolation – $\sigma = 76,6$ MPa, adhesive strength in shear – $\tau = 15,0$ MPa, residual stresses – $\sigma_r = 1,4$ MPa, destructive stresses in bending – $\sigma_b = 100,0$ MPa, modulus of elasticity in bending – $E = 3,70$ GPa, heat resistance (for Martens) – $T = 343$ K.

1. Buketov A.V., Sapronov O.O., Brailo M.V., Aleksenko V.L. Influence of the ultrasonic treatment on the mechanical and thermal properties of epoxy nanocomposites // Materials Science.-Vol. 49, Number 5.-2014.- P.696-702.