NANOSTRUCTURED POLYMER COATINGS FOR REPAIR AND STRENGTHENING OF CONCRETE STRUCTURES

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Summary. Reinforced concrete structures often require strengthening either due to various damages caused by aggressive influence of environment or by the increasing load which arises during the operation of these structures. Surface coatings are able to reduce considerably the penetration, to slow down the rate of deterioration of concrete cover and to overcome most durability problems associated with external attack. The strengthening of reinforced concrete structures by means of externally bonded polymer composite coatings is now considered as an effective method for durability and load capacity enhancement, increasing of crack resistance.

In the article are presented production and properties of the new type of epoxy composition with nanoheterogenic structure based on epoxy resin, liquid rubber, amine hardener and fluorinated surfactants of various chemical structure.

The properties of rubber-modified epoxy compositions, used as a matrix of anticorrosive coatings, depend not only on types of epoxy resins, liquid rubbers and curing agents but also on heterogenic structure of these systems. Formation of nano-heterogenic systems with fluorine containing surface active additives of optimal chemical composition is an effective method of obtaining of advanced coatings. There are shown that the mechanical properties and chemical resistance of nano-coatings are significantly higher by use of surfactants with most effective are surfactants with linear molecules containing carboxyl groups.

The nanostructured epoxy-rubber coatings for concrete and reinforced concrete structures provide a sharp lowering of deformability of these structures at short- and long time loading. Testing of reinforced concrete beams shows that creep deformations of the beams with these coatings at bend decrease by 2 ÷ 2.4 times as compared with beams without coating. The developing coating provides increasing of tensile strength of concrete and consequently the growth of crack resistance and durability of structure. The researches show that ultimate tensile strength of concrete can be increased by 2 ÷ 3 times. The moment of cracks formation in beams with the epoxy-rubber coating is fixed later than that in control
(without coatings) beams. In the case of cracks appearance in concrete their value is $3 \div 4$ times less than in control samples.

Predictive models for the deterioration of the coatings over time caused by aggressive actions is suggested.