CATALYSIS CARBONIZATION AND FOAMCOKE FORMATION IN THE INTUMESCENT FIRE RETARDANT COATINGS CONTAINING TUBULES.

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The paper is dedicated to the research of intumescent composites based on epoxy resin cross-linked by polyethylene polyamine and containing ammonium polyphosphate(APP) and such modifying additives as calcium borate, manganese dioxide, nickel and chromium containing tubulenes as stimulators of carbonization and gas absorbers.

The changes in composition and physico-chemical properties of modified composites under thermal and fire actions have been investigated by X-ray photoelectron spectroscopy, atomic force microscopy and local force spectroscopy.

It is found out that ammonium polyphosphate mainly stimulates carbonization processes on the inner surface of a bubble being formed during foam coke formation. It is shown that the introduction of metal containing tubulenes leads to the formation of fire retardant and low flammable composites with high coke and carbon structures content, and the use of calcium borate in the compositions sufficiently increases the strength of foam coke being formed.

Surface and boundary layers (split surface) of both the epoxy resin cured and pyrolysis residues are investigated by X-ray photoelectron spectroscopy (XPES). When the sample is heated up to the temperature of pyrolysis beginning (260 ^{0}C), the egress of phosphorus containing groups onto the sample surface is registered. This is proved by the increase of phosphorus concentration on the surface as well as by the intensity distribution of nitrogen, carbon and oxygen 1s lines in X-ray photoelectron spectrum. When the temperature in the boundary layers increases, the decrease of relative quantity of C-OR and carboxyl groups is registered, this proves the carbonized layer growth.

In comparison with the results obtained, the introduction of nickel containing tubulenes (Ni-T) into the composition in APP and Ni-T 10:1 ratio leads to the increase of carbon-carbon and carbon-metal groups in approximately two times.

Thus, nickel containing carbon tubules are active precursors of new carbon phase and structural additives, which stimulate the proportional distribution of NH_3 bubbles into the foamcokes formed. In turn, these additives promote the growth of initial composite heat capacity and the increasing of foamcoke strength