Nanocomposites and nanomaterials

Chemistry of modified montmorillonite in flame-retardant intumescent coatings

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One of the modern "green" technologies, used to enhance fire-resistance rating and environmental friendliness of fire-retardant paints, is based on using nanomaterials. Applied as individual additives, or as a part of nanocomposites with polymeric matrix, they tend to significantly increase both: fire-resistance and ecological characteristics of the coatings.

The researches on chemical processes within the typical intumescent system, which consists of ammonium polyphosphate, pentaerythritol, melamine, ethylene-vinyl acetate copolymer and includes organo-modified montmorillonite additives, enable to determine at least three ways in which nano-additives act under high temperature:

1) They catalyze a number of chemical processes between the components of intumescent system;
2) They produce thermally stable nanocomposite with copolymer;
3) They act as nucleation agents in the process of coke layer formation.

As a result of such effects of organo-modified montmorillonite, the increase (about 5-10%) occurs in fire-resistance rating of steel structures with intumescent systems applied. The systems, mentioned above, included the additives of modified clay and were tested according to national standards.

The "artificial ageing" tests according to ETAG 018-2 [1] show, that when the intumescent coating is exposed to environmental conditions for type Z_2, the additives of organo-modified montmorillonite induce 3 years increase in coating's durability compared to the standard system without any additives.

1. European Organisation for Technical Approvals (2006), Guideline for European Technical Approval of Fire Protective Products "Part 2: Reactive coatings for fire protection of steel elements", available at: http://www.aedilitia.itc.cnr.it/documenti/018-2.pdf (Accessed 12 February 2015).