Nanocomposites and nanomaterials

Heat capacity of penton filled by multi-walled carbon nanotubes

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The studying of properties of polymer composite materials - is one of the fundamental complex and multifaceted problems of polymer physics.

It is well known that addition of disperse fillers into polymer materials causes a wide range of phenomena and effects, which origin conditioned by influence of modifiers on polymer composite materials structure. Depending of fillers properties their modifying influence on polymer composite materials properties is different.

Purpose of this work is ascertainment of active fillers influence on heat capacity of polymer composite materials based on highly stable and chemically resistant high-molecular polyether – penton (3,3-bis(chloromethyl) oxacyclobutane).

As fillers were used acid cleaned from mineral impurities multi-walled carbon nanotubes 10 ÷ 40 nm OD, with specific surface about 200 ÷ 400 m^2/g and with specific electrical resistance about 0,05 ÷ 0,1 ohm·cm.

Penton - multi-walled carbon nanotubes system specimens were prepared at following thermo-baro-time (T-p-t) condition: heating rate 3,5 K/min, aging at 483 K pending 15 min under pressure of 20 MPa, cooling from melt with 0,5 K/min rate, what correspond to better technological conditions of composite recycling with taking account of filler and polymer matrix properties.

Investigations of PCM's specific heat capacity temperature dependences were conducted by the differential scanning calorimetry method using experimental facility DSC Q2000 produced by TA Instruments (USA) 233 - 493 K temperature rate for different disperse fillers volume content ($0 \leq \varphi \leq 2$ %).

It was found, that for penton - multi-walled carbon nanotubes system composites is characterized by dividing of process of transition from highly elastic to viscous flowing condition for two components - low- and high-temperature. It is caused by strong multi-walled carbon nanotubes structural action on penton boundary layers and appears in origin of more ordered than regular for penton structure, which proceeds to viscous flowing condition at higher temperature.