

INFLUENCE OF TECHNOLOGICAL FACTORS ON PROCESSES OF STRUCTURIZATION OF CARBON NANOPARTICLES IN OLIGOMER MEDIUM

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Recent ways of regulation of electric and heat conductivity of oligomer materials are based on introduction of nanodispersed fillers into the composition. In particular, structure formation and generation of continuous clusters penetrating into the bulk takes place due to introduction of 1-10% (mass) carbon nanoparticles into the oligomer binding agent at given processing conditions. Electric and heat conductivity increases along with substantial increase of viscous properties of the composition. In spite of the lower electric conductivity of the carbon materials compared to metals, they have a pronounced structuring ability. This allows to obtain compositions with an electric conductivity comparable to that of metal-filled materials at relatively low filling degrees.

Main processing factors, influencing on the formation of continuous arrangement of carbon nanoparticles in the polymer matrix, have been studied in the context of this work. Temperature, volume filling, shear rate, time of structure formation, binding agent viscosity are among these factors. Experimental studies of structure formation were carried out using rotary viscometer Rheotest RN4.1 and retrofitted rheoconductometric installation based on viscosimeter Reotest 2.1 for determination of electric conductivity of the composition.

Electric conductivity of the composition was shown to be the main parameter used for determination of initiation of the nanocarbon continuous structures. Existence of the electric current, passing through the composition, indicates the structure of carbon in the composition to be continuous and the structure elements to be commensurable to the distance between electrodes and cylinders of the viscosimeter. It was determined, that the current increases proportionally with the increase of the number of carbon nanoparticle chains per volume unit. Formation of the cluster structures in the polymer nanomaterials was confirmed by the visual image obtained using optical microscope Olympus BX 51. The results obtained make possible creation of the materials with electric conductivity level lying in the range of $(1 \div 20) \times 10^{-6}$ cm/m.

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