

# **Nanocarbon-Based Polymeric Composites**

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The polymeric composite theory predicts that a decrease in filler particle size from statistic average diameter  $1 \times 10^{-6}$  m down to  $(1-5) \times 10^{-8}$  m can give rise to polymeric materials of a much higher performance.

In late 70s of the past century some research teams succeeded in the synthesis of nanodiamonds (ND) through detonation decomposition of high explosives. The technology of ND synthesis proved to be so happy that it made possible to get ultradispersed substance in commercially required quantities. ND modifier (0.1-2.5 mass.%) effect on elastic-strain properties has been shown in the work for a wide choice of polymers.

The addition of modifiers to polymer is shown to bring about an effect yet reported – a decrease in hydrodynamic viscosity of the system.

We suppose that the reinforcing effect is caused by the formation of physical network in supramolecular structures that result from polymer matrix self-assembly influenced by fields of force of highly active nanoparticles. The most complete model suggested in described by the theory of dispersion-reinforced composites. Dispersion-filled elastomeric materials are considered from this theory viewpoint as certain hierarchic systems with pronounced size levels. A bulk of polymer including if only one nanoparticle with matrix layer around is meant the lower size level. The system topology of structure unit distribution in the bulk (allowing for ND real polydispersity) will then be characterized by the presence of assemblies of large structure particle units H surrounded with small structure particle units L. Hence, so formed supramolecular structure should be more isotropic than that with individual H-type filler in.

An organized supramolecular structure and improved rheological behavior of the composition contribute to a better crosslinking and therefore, higher performance.