Detonation Nanodiamonds. What are They in Polymers?

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Composite materials loaded with nanometer-sized reinforcing fillers are widely believed to have the potential to push polymer mechanical properties to extreme values. Realization of anticipated properties, however, has proven elusive. The analysis presented here traces this shortfall to a native morphology of the filler. The work considers the criteria of distinction between the finedispersed and nanostructured substances, showing that only nanostructured substances have real prospects of use in the polymer materials science. We examine elastomeric, thermoplastic, and thermoset composites loaded with a variety of superfine reinforcing fillers such as precipitated silica, nanocarbon (60fullerens, DC[1], DND,), and carbon nanofiber. As determined by light scattering, and electron imaging all particles of substances selected arrange in nanoscale region.

Also was examined their blends with carbon black as the fillers of polymers. Collected data were analyzed in frame of classic and present theories of reinforcement polymers blend and its final resin.

It is significant, as shown in the essay, that sophisticated modern theories couldn't explain the complex of experimental data. As a model, an information-energy hypothesis asserting formation of polymeric matrix supramolecular organization was proposed based on the information theory reasoning. Within the framework of this model, the detonation synthesis nanodiamonds should be regarded as an information-saturated system which in the process of achievement of Gibbs' minimum of energy by the polymeric compound generates new physical elements of supramolecular organization due to the loss of information. We cannot substantiate the information transfer mechanism in this essay. However, we deem perspective the model based on the properties of solvate electrons efficiently penetrate to the surrounding environment and coordinate it.

[1] DC – diamond carbon. Immediate product of detonation prosses.