- **Nanocomposites and nanomaterials**

The influence of Fe(3+) complex on the microheterogeneous structure of the cross-linked polyurethanes with carbon nanotubes

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The introduction of carbon nanotubes (CNT) in cross-linked polyurethanes (CPU) allows obtaining the composites with electrical conductivity, thermal conductivity, tensile strenght and other properties. Such characteristics of these composites, especially electrical conductivity, appear due to ability of nanotubes to formation of percolation cluster. However, CNTs can aggregate in the process of composites formation. Therefore, for the decreasing of the aggregation of nanotubes and their better distribution in polymer matrix we obtained this composite *in situ* and use the catalyst of urethane formation (ferrum (3+) acetylacetonate ($Fe(acac)_3$)).

CPU was synthesized via stage of prepolymer based on 2,4-/2,6-toluenediisocyanate (80/20) and polypropylene glycol ($M_w = 1000$). CNTs were sonicated in dichloromethane and then added *in situ* to CPU on cross-linking stage to get CPU/CNT composites. The concentration of nanofillers was from 0,1 to 3% wt. CPU/CNT/$Fe(acac)_3$ was synthesized by adding of $Fe(acac)_3$ (1 % wt.).

For the analysis of distribution of nanotubes and type of forming fractal structures the curves of the small scattering x-ray were obtained. These curves were analyzed with fractal-cluster model. For investigated system the two types of fractal clusters are formed. There are the fractal-mass particles and the fractal-surface particles.

№	System	D_f	D_s	R_g, nm
1	CPU/3%CNT	2,9	2,0	14,5
2	CPU/3%CNT/1% $Fe(acac)_3$	2,7	3,0	10,5

The calculated fractal dimension of fractal-mass particles (*Df*) in CPU/3%CNT is 2,9. The fractal dimension of fractal-surface particles (*Ds*) in CPU/CNT is 2,0. For the system CPU/3%CNT/1%$Fe(acac)_3$ *Ds* decreased to 2,7, *Df* is 2,7.

The average dimension of micro heterogeneity (*Rg*) is equal 14,5 nm (for CPU/3%CNT) and 10,5 nm (for CPU/3%CNT/1% $Fe(acac)_3$). The decreasing of *Rg* for the system with $Fe(acac)_3$ was caused by the kinetic stabilization of nanotubes and decreasing of aggregation due to catalytic effect of complex.