## Nanocomposites and nanomaterials

# Stabilization of carbon nanotubes aqueous suspension by adsorption of laponite nanoplatelets and surfactants

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Carbon nanotubes (NTs) are promising materials for many applications, for example, as NTs-based adsorbents, sensors and biosensors etc. In aqueous suspensions NTs have strong tendency for aggregation due to van der Waals and hydrophobic interactions. Stabilization of aqueous suspension of NTs can be reached by adsorption of charge nanoparticles, different surfactants or polymers, surface treatment, etc.

For our study NTs were synthesized by CVD method in the presence of Fe-Mo-Al catalyst (Specmash, Kyiv, Ukraine); their surface contained a small amount of hydroxyl and carbonyl groups. Nanoplatelets of laponite and CTAB were used to enhance the dispersing of NTs and aggregation stability of their suspension.

The degree of aggregation in NTs suspension with different mass ratios of laponite and NT ($X=m_L/m_{NT}$, g/g) was measured in a flow system using PDA 2000 (Rank Brothers Ltd, UK). The optimum ratio $X$ ($\geq 0.5$), corresponding to the maximum stability of suspension, was determined.

Addition of increasing amounts of CTAB, higher than $5 \cdot 10^{-6}$ M, gives a gradual stabilization of NTs suspensions probably as a result of overcharging the negative surface by adsorbing cations of the surfactant and formation of protective "steric" barrier around nanotubes surface. The optimal CTAB concentration for suspension stabilization was found to be $5 \cdot 10^{-6}$ M-$3.7 \cdot 10^{-5}$ M.

Also it was shown that an increase of the stirring rate results in an increase of NT+CTAB suspension stability due to destruction of formed aggregates. The same result was obtained for $X=1$ suspension, i.e. addition of CTAB enhanced de-aggregation of aggregates in the suspension. At the same time, in a narrow concentration interval CTAB can serve as a suspension destabilization agent as a result of surface charge neutralization by adsorbing cations of the surfactant.