Problems of stability of disaggregated nanodiamond hydrosols

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The recently obtained Disaggregated Detonation Nanodiamond (DDND) is a very perspective material for using in many areas. In this concern the investigations of it stability, especially in biological environment, are actual.

The two types of DDND (particle size 5 nm) were investigated in this work. The DDND hydrosols were prepared accordingly to [1-2]. The values of ζ-potential in these hydrosols were –45 and +45 mV respectively.

We investigated the ζ-potential and size values of DDND hydrosols in dependence of pH value. We have found that the both type of hydrosols were stable in a wide range of pH at low values of ionic strength.

The both types of hydrosol completely coagulates if pH<2. We have demonstrated the possibility of restoring of deagglomerated state of the DDND with negative ζ-potential after recovery of pH. The restoring of the positive charged DDND occurred being impossible.

We observed that increase of the ionic strength gives drop of the aggregative stability of DDND is even if the pH value is constant. The limit of coagulation stability of DDND is about 0.05 mol/l. We found that in isotonic solution (NaCl 0.9%) the DDND coagulates. Negatively charged DDND could be restored into deagglomerated state by washing although positively charged DDND couldn't be restored. The addition of multivalent metals into DDND hydrosol causes it partial coagulation, proportional by quantity of added metal.

The mixing of oppositely charged DDND hydrosols gives their coagulation.

Thus we found the potential instability of DDND in simulated biological environment. We have demonstrated that the DDND stability in bio-environment and in cell cultures is important, but still unsolved problem.

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