«Evolution of the size distribution of gold nanoparticles under the action of laser radiation»

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The most commonly used techniques for the synthesis of gold nanoparticles are methods of chemical reduction and laser ablation in liquid. With regard to the fields of biomedicine and biophysics, the advantage is given to the laser ablation method due to the chemically pure method of obtaining nanoparticles, as well as the functional features of the synthesis of nanoparticles by laser ablation, in which it is possible to obtain nanoparticles of the desired size by varying the parameters of laser radiation.

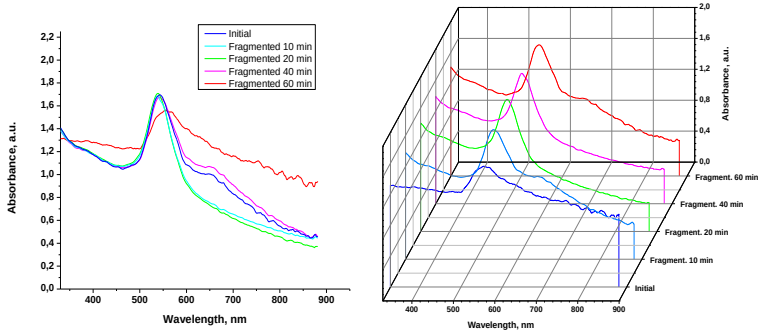

Fig.1. Evolution of absorption spectra of colloidal solutions of gold nanoparticles at different fragmentation times.

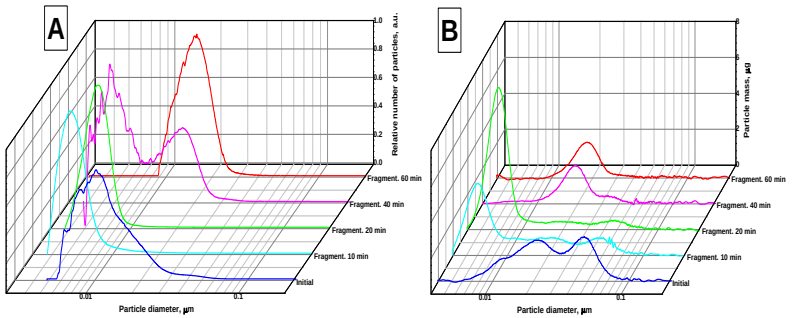

Fig.2. Evolution of the distribution of gold nanoparticles (A) by the number of particles and (B) by weight, depending on the size of the nanoparticles when exposed to a colloidal solution of Nd:YAG laser radiation.

From the experimental results obtained, it follows that at first there is an intense fragmentation of gold nanoparticles and a sharp increase in concentration. Then, when the threshold concentration is reached, there is a decrease in the number of small particles in the colloid and the formation of agglomerates. The process of agglomerate formation can be explained by an increase in the probability of contact of small nanoparticles with each other. The speed of this process is directly related to the concentration value – the greater the concentration of nanoparticles, the greater the number of contacts of nanoparticles and, as a result, the rate of formation of nanoparticle agglomerates should be higher.