

Nanochemistry and biotechnology

Preparation of nanowires based on the tobacco mosaic virus and gold nanoparticles

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One of the intractable problems in the field of nanotechnology is to produce nano-objects of the same shape and size. To solve this problem, the most promising is the use of tobacco mosaic virus (TMV). The procedure involves the following steps: preparing stock solutions KAuCl_4 and 1% $\text{Na}_3\text{C}_6\text{H}_5\text{O}_7 \times 2\text{H}_2\text{O}$ and receiving of colloidal gold addition to the boiling solution of potassium tetrachloroaurate solution of sodium citrate in a ratio of 20 ml of 1 mM KAuCl_4 + 2 ml 1% $\text{Na}_3\text{C}_6\text{H}_5\text{O}_7 \times 2\text{H}_2\text{O}$ in several stages and stirring until the red color. In the first step, after addition of sodium citrate were added purified TMV viruses.

Studies have shown a surface plasmon resonance of gold nanoparticles at a wavelength of 522 nm, which corresponds to a particle size of 15-20 nm and confirmed by studies by atomic force microscopy (Fig.1 ,2a). During reduction process of gold in five cycles by sequential addition KAuCl_4 and NaBH_4 , after solution was cooled the purified modified TMV was added to homogeneous dispersion. At the expense of that was achieved a uniform deposition of nanoparticles on TMV (fig.2b).

Thereby nanowires based on tobacco mosaic virus (TVM) and gold nanoparticles have been obtained, promising for use as materials for nano-electronics and medicine (in particular, to create cheap memory chips with a high recording density, sensor elements for various purposes, process control systems, transport of biologically active components in medicine).