

## Peculiarities of formation, growth and stabilization of gold/silver nanoparticles using tryptophan as reducing/stabilizing agent

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Nanoparticle-based medicine, especially noble metals, has a huge potential with novel applications continuously being developed for use in cancer diagnosis, detection, imaging, and treatment [1,2]. The combination of gold and silver in one nanoparticle (NP) and the use of essential amino acid tryptophan (Trp) as reductant and stabilizer let to enhance effectiveness and reduce toxicity of nanosized metals as chemotherapeutic agents [3]

The mechanisms of reduction of metals with Trp and stabilization of mono- and bimetallic NPs of gold and silver, their morphology, stability and optical properties were investigated depending on pH of initial reagents.

Optical spectra of NPs solutions contained typical metal surface plasmon resonance (SPR) bands under certain conditions. For targeted Au NPs the high acidity of both reagents is necessary, where gold is in a state  $[\text{AuCl}_4]^-$ , as well as tryptophan according dissociation constants is present in the form of cation. In the case of silver the reduction of the metal occurs in the presence of tryptophan in anionic form that exists at high pH. The changes in the shape and position of the amino acid bands of metal/Trp system indicated the C<sub>2</sub>-C<sub>3</sub> bond breaking in indole ring. The formation of charge transfer complexes between NPs and tryptophan was shown.

In the work an attempt was made to combine different experimental conditions to obtain stable bimetallic Ag/Au nanoparticles at neutral pH taking into account surface electrical characteristic of colloids that allows their use in physiological environment.

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