

# Laser synthesis of plasmonic gold nanoparticles

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In this work, the results of the synthesis of nanoparticles on the gold surface due to laser processing were investigated. The sizes and chemical composition of nanoparticles, which make it possible to change the colorimetric characteristics of the gold surface, have been determined.

Laser heating leads to intense evaporation of the precious metal and the formation of a metal vapor above its surface. As a result of vapor condensation, nanoparticles are formed, which are partially deposited on the metal surface. Changing the parameters of laser irradiation makes it possible to obtain particles with the sizes and distributions necessary for the appearance of the effect of plasmon resonance and to obtain a visually observable colour.

The coloration of the gold surface was studied on a sample of a 24 K gold plate 0.3 mm thick. The laser processing was performed in a scanning nanosecond pulsed mode with overlapping pulses along one axis. A ytterbium fiber laser with a wavelength of 1.06 m was used as a laser source. The samples were examined using optical microscopy, spectrophotometry, scanning electron microscopy, and energy dispersive X-ray spectroscopy. Based on the obtained results, the correlation between the colorimetric characteristics of gold nanoparticles and their size and distribution was determined. The composition of the layer synthesized by nanoparticles was also determined.

The reported study was funded by RSF, project number 19-79-10208.