Luminescent gold nanoclusters for the detection of anti-tumor drugs

Yuliya A. Podkolodnaya, Kseniya R. Kalishina, Irina Yu. Goryacheva and Anna M. Vostrikova

Saratov State University, Russia

Gold nanoclucters (GNCs) have drawn attention in recent years for their high photoluminescence, chemical stability, good biocompatibility, cost-effective, and low toxicity. The unique properties of luminescent GNCs make them became a very promising alternative to replace traditional fluorescent materials.

In this work, we report a simple synthesis of luminescent GNCs stabilized by bovine serum albumin. The obtained structures exhibit maximum luminescence in the 660 nm region with a quantum yield of 24±2%. We have investigated the composition and structure of GNCs using IR spectroscopy, gel electrophoresis, X-ray diffraction analysis, circular dichroism spectroscopy and transmission electron microscopy.

We demonstrate the feasibility of using GNCs for the detection of anti-tumor drugs (exemplified by doxorubicin) in biological fluids. The anthracycline antibiotic doxorubicin is able to bind to protein-stabilized GNCs, causing luminescence quenching. We determined the Stern-Folmer constants, bimolecular quenching constants, binding constants and detection limits of the antitumor drug to determine the efficiency of luminescence quenching. The use of GNCs as a nanosensor could be a useful tool for medical applications to adjust the chemotherapy protocol.

This work was supported by the Russian Science Foundation (grant 23-73-02271)