18

IR Luminescence of Polyfunctional Associates of Indocianine Green and Ag_2S Quantum Dots*

© T.S. Kondratenko, M.S. Smirnov, O.V. Ovchinnikov, I.G. Grevtseva, and A.N. Latyshev

Voronezh State University,
36018 Voronezh, Russia

e-mail: tamara-shatskikh@rambler.ru

Received January 18, 2020
Revised January 18, 2020
Accepted April 20, 2020

In this work, manifestations of IR luminescence sensitization of Indocyanine Green during conjugation with colloidal Ag_2S quantum dots with an average size of 2.2 and 3.7 nm, passivated with thioglycolic acid molecules (Ag_2S/TGA QDs) are studied using absorption and luminescence techniques. The possibility of enhancing luminescence in the dye monomer band (820 nm) under excitation at 660 nm by a factor of 6 in the presence of Ag_2S/TGA QDs (2.2 nm) due to a decrease in the polymethine dye chain movement via coordination interaction with QDs was demonstrated. The way to switch-over from the first therapeutic window of biological tissue transparency (NIR-I, 700−950 nm) to the second (NIR-II, 1000−1700 nm), based on sensitization of IR luminescence of Ag_2S/TGA QDs with an average size of 3.7 nm in the region of 1040 nm due to of resonance non-radiative transfer of excitation energy from Ag_2S/TGA (2.2 nm) QDs at 900 nm to Ag_2S/TGA QDs (3.7 nm) via the J-aggregate of ICG dye, which acts as an exciton bridge.

Keywords: J-aggregate, non-radiative decay, exciton absorption.

* The 2nd international school-conference for young researchers „Smart Nanosystems for Life“, St.Petersburg, Russia, December 10−13, 2019.

Полный текст статьи опубликован в „Optics and Spectroscopy“ 2020 V. 128. N 8.