Photoactive hybrid organo-inorganic nanocomposite polymeric materials containing quantum dots

Solovei A.R., Arzhakova O.V.
Faculty of Chemistry, Lomonosov Moscow State University, Moscow, Russia,
arina.solovey.2002@mail.ru

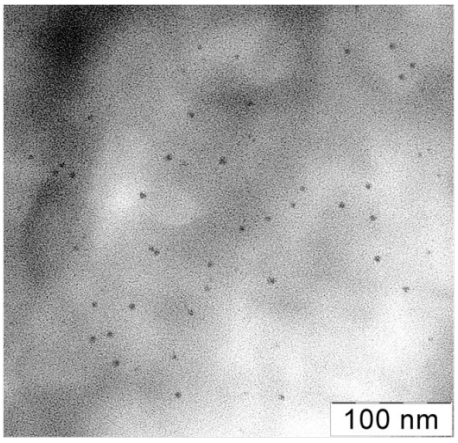
Keywords: nanocomposite, quantum dots

https://doi.org/10.36291/HIT.2022.025

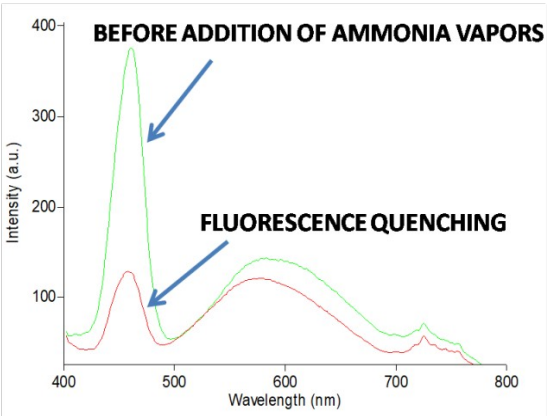
Ecological problems present the most pressing issues of XXI century and demand the development of innovative high-performance sustainable sensors for safety control and ecological monitoring. The basic requirements to the sensing materials are concerned with their efficient and quick response towards the action of analytes and convenient practical use.

This work addresses the new approach for the preparation of high-performance optochemical sensors based on mesoporous polymeric matrices and inorganic quantum dots. The mesoporous HDPE and PTFE matrices were fabricated using the strategy of environmental crazing. The mesopropus polymeric matrixes were loaded with photoactive additives using the protocols of forced and passive wet impregnation. Quantum dots based on CdS were shown to be uniformly distributed within the polymer matrix as nanoparticles with mean dimensions of 3 nm without any aggregation. The resultant optochemical materials show high fluorescence intensity as presented by two well-resolved peaks and experience fluorescence quenching when subjected to the action of ammonia vapors. Upon removal of ammonia vapors, the fluorescence peaks are fully restored, and this behavior is reproduced in many cycles.

Hence, the proposed approach allows preparation of new optochemical nanocomposite sensors with quick and intensive response towards analytes which can be used for the safety control.



TEM image of CdS/HDPE sample



FLUORESCENCE SPECTRUM OF CdS/HDPE SAMPLES BEFORE AND AFTER ADDITION OF AMMONIA VAPORS

This work was supported by the Russian Science Foundation (Grant no. 20-13-00178).