ABSTRACT

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Title of diploma thesis: Testing optical properties of Quantum-Dots nanoparticles I.

The diploma thesis deals with testing optical properties of Quantum-Dots nanoparticles (QDs), which have been verified as chemiluminescence (CL) signals enhancers. For the reaction luminol (5-aminophthalhydrazide) was used in alkaline medium, which was oxidized by hydrogen peroxide in the presence of catalyst potassium ferricyanide. The experiment was performed in the sequential injection analysis (SIA) system using detection in spiral flow cell Schoeffel. Different concentration levels of QDs nanoparticles were tested with main focus on low concentrations. QDs solutions with different emission maxima and surface modification were tested, which were prepared at the Department of bioanalytical instrumentation in the Institute of Analytical Chemistry in Brno. The following modifications of CdTe nanoparticles were used: mercaptopropionic acid (MPA 520 nm, MPA 540 nm, MPA 636 nm), thioglycolic acid (TGA 620 nm), mercaptoethylamine (NH_2 590 nm) and CdTe/CdS particles coated with mercaptopropionic acid (MPA CdTe/CdS 640 nm). Every particle was compared with measuring without QDs as well as repeatability of measurements. Further stop-flow measuring was performed for every particle in solution in which the highest intensity of chemiluminescence had been found. Everything was evaluated by signal height and area (increase and length of CL signal). Data obtained during experimental measuring 6 kinds of QDs nanoparticles showed, that the highest increase of chemiluminescence was recorded using QD NH_2 with emission maximum at 520 nm, the procentual increase was of 42.28%. In case of peak area evaluation the best enhancing effect was found for QDs NH_2 with maximum emission occurs at 590 nm, the procentual enhancing was of 91.02 %, however, the shortest signal was recorded for this nanoparticle.