Laboratoř Metalomiky a Nanotechnologií

Praktický kurz

Aplikace kvantových teček CdTe a CdSe případně CdZnSe do liposomálních struktur, včetně jejich modifikací

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Kvantové tečky CdS (CdS QDs) byly připraveny reakcí octanu kademnatého s merkaptosukcinovou kyselinou. pH reakční směsi bylo upraveno přídavkem vodného roztoku amoniaku na 8. Poté byl za míchání přidán roztok sulfidu sodného a reakce pokračovala po dobu 1 hodiny. Roztok je bezbarvý. Při vlnové délce 312 nm je zbarvení reakční směsi modré. Další modifikace kvantových teček byly získány mikrovlnným ohřevem na zařízení Multiwave 300 (Anton Paar, Graz, Austria) při 300 W, teplotě 100 – 130 ºC a době ohřevu v rozsahu 10 – 18 minut.

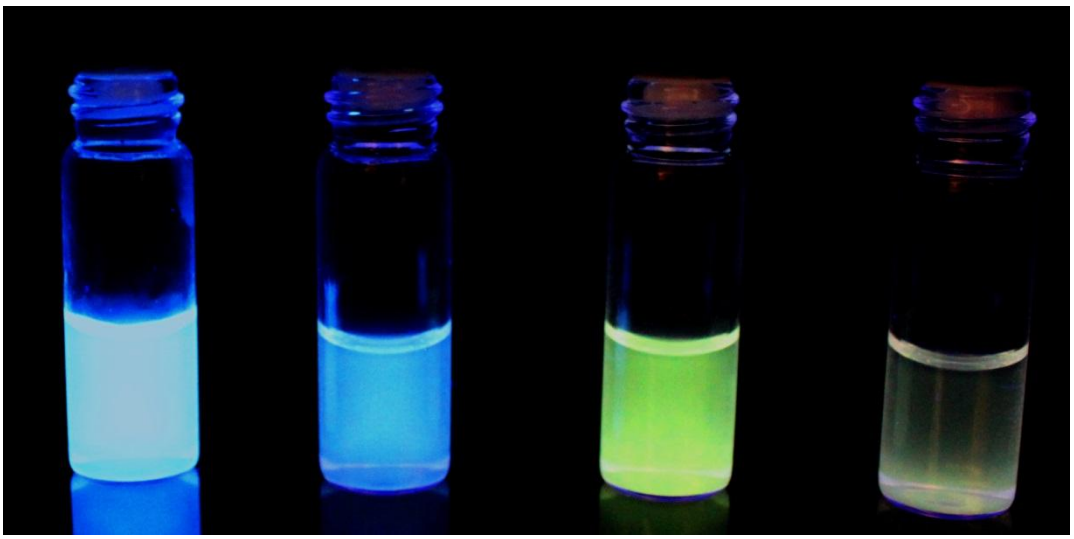
CdTe/CdS-15-1

Spare solution of CdTe QDs (A) was prepared by dissolving cadmium acetate dihydrate (0.044 g) in 76 ml of MiliQ water in a 200 ml beaker on magnetic stirrer. Then mercaptosuccinic acid (MSA) (60 mg) in water (1 ml) was added followed by 1.8 ml of 1M NH_3. Finally, a solution of Na_2TeO_3 (0.0055 g) in water was added and after few minutes 50 mg of $NaBH_4$ was poured to the stirred solution. Solution was stirred for 1 h, volume was adjusted to 100 ml with addition of water and after that it was heated in vials filled with 2 ml of the solution in microwave oven Multiwave 300 (Anton Paar, Graz, Austria) (300 W, 120 ºC, 10 min).

Spare solution of CdS (B) was prepared by a reaction of cadmium acetate dihydrate (0.022 g) with reduced glutathione (GSH) (0.1229 g) and 1 ml of 1M NH_3 in 24 ml of water. After that, sodium sulphate nonahydrate (0.012 g) in water (25 ml) was added with stirring. The solution was stirred for 2 h and used for next reaction.

CdTe/CdS QDs were prepared by mixing of 1 ml (A) and 1 ml (B) in vial, which was subsequently heated in microwave oven at 90 ºC for 10 min.

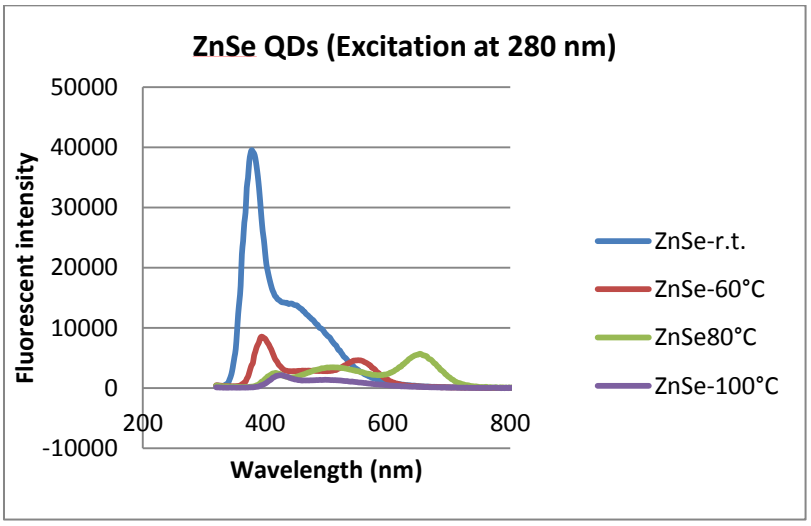
Photo of ZnSe QDs



r.t. 60°C 80°C 100°C

Influence of temperature of heating on fluorescent properties

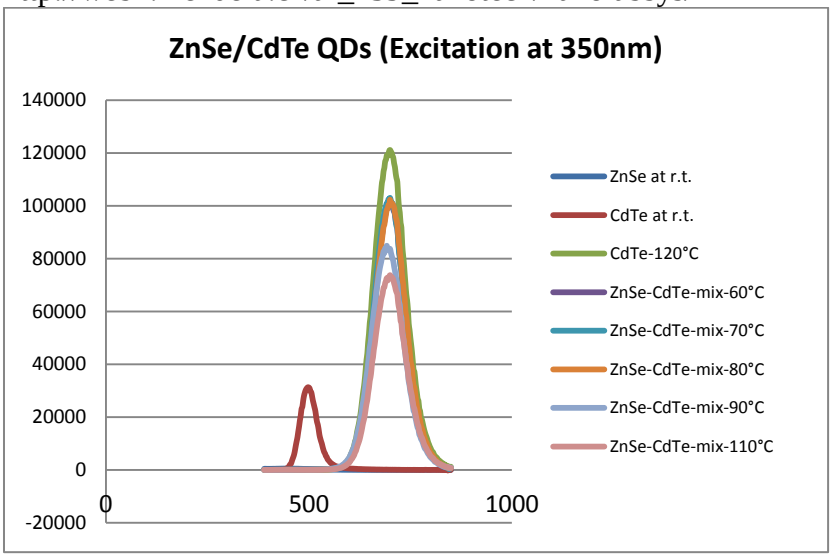
Vzorek by měl být homogenizován sonikací ultrazvukovým



Preparation of CdTe/ZnSe QDs

We prepared ZnSe/CdTe QDs by mixing ZnSe QDs with CdTe QDs in an appropriate proportion and heating at different temperature.

ZnSe r.t.	CdTe r.t.	ZnSe/CdTe r.t.	CdTe 120°C	ZnSe/CdTe 60°C	ZnSe/CdTe 70°C	ZnSe/CdTe 80°C	ZnSe/CdTe 90°C	ZnSe/CdTe 110°C



Influence of reaction conditions was studied. We have paid our attention especially on reaction mixture ratio, pH, temperature of heating, reaction time and power of microwave heating.

Liposomes have been prepared as thin films from chloroform solution of Cholesterol, 1,2-dioleoyl-sn-glycero-3-phospho-rac-(1-glycerol) sodium salt and phosphatidylcholine. Preparation way was shown.

Solutions of quantum dots were added to liposomes films and after hydration, the samples were shaken and heated at 60°C for 15 minutes. After cooling the samples were ready for use.