

INVESTICE DO ROZVOJE VZDĚLÁVÁNÍ

Name: Fluorescence Properties of Quantum Dots

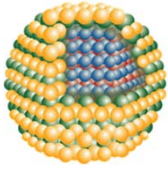

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Date: 15. 11. 2013

Reg. č. projektu: CZ.1.07/2.4.00/31.0023
 Název projektu: Partnerská síť centra excelentního bionanotechnologického výzkumu

QDs


- Semiconductor nanoparticles (1 – 20 nm)
- Elements from II - V. group of periodic table
- very good fluorescence properties
 - high quantum yields
 - big Stokes shifts
 - can be excited by a broad spectrum of wavelengths
 - emission spectra are narrow
 - resistant to photobleaching and chemical degradation
- new fluorescent materials - usable instead of organic dyes for biological labelling


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QDs applications

- Chemical modification stabilize the particles
 - thiol-group containing compounds
 - mercaptopropionic acid, glutathione, cysteine
- QDs do not have specific function → surface modifications


+

antibodies
therapeutics



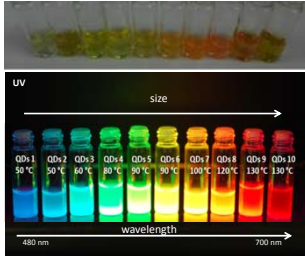
CdTe

- QDs applications are widespread
 - tracing drug transport
 - in vivo imaging of biological processes (cancer cell proliferation)
 - monitoring of targeted drug delivery

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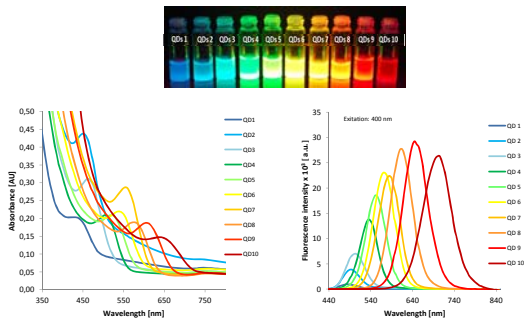
Synthesis of CdTe QDs

- CdTe QDs :
 - Cadmium (II) acetat $Cd(OAc)_2$ + Mercapto Succinic Acid (MSA) + NH_3 + Na_2TeO_3 + $NaBH_4$ → microwave synthesis
 - Microwave heating conditions: max. 300 W, 20 minutes, temperature: 50 – 130 °C
- A wide range of different colour QDs can be synthesized



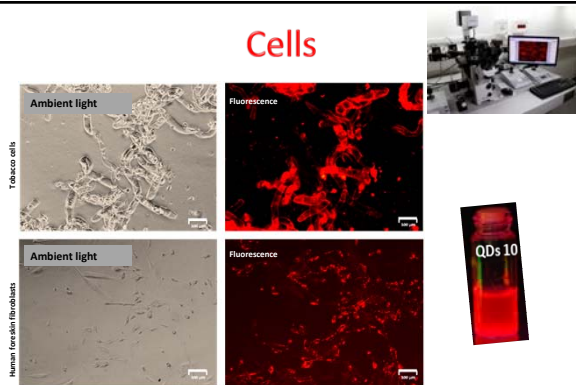
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Fluorescence of QDs



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Cells




Ex. 640 nm/Em. 695 nm

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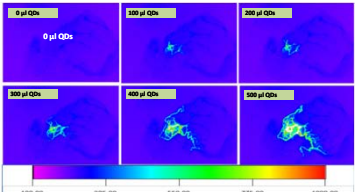

The application into the muscle tissue

- Injection
- Infusion
- Tube

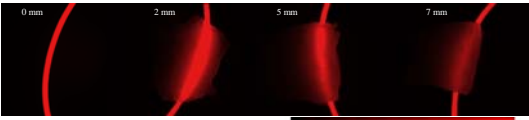
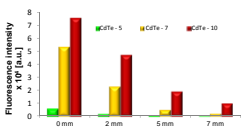
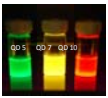


Fluorescence intensity of QDs in the tissue depends on:

- the concentration and the solvent
- the volume
- the depth

Muscle tissue – determination of the depth

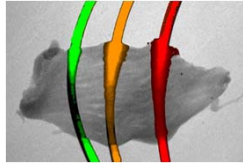
NIR
 ↓ autofluorescence
 ↑ penetration

QDs in live animal



Conclusion

- QDs have great fluorescence properties
- Cover almost the whole spectral range
- QDs can be used in biological labelling instead of organic dyes
- QDs can be used for visualisation



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Future plans...

- Surface functionalization of QDs by antibodies to ensure targeted transport to the specific site
- Finally, conjugation of the complex with drugs/genes

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Financial support by IGA TP1/2013 is highly acknowledged.



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Thank you for your attention.

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