# Review of Ph.D. Thesis

***Ing. Uliana Kostiv:***
**Design and characterization of advanced polymer-coated upconversion nanoparticles**

The thesis is focused on the preparation a characterization of upconversion nanoparticles with desired morphology, i.e. size, its distribution, crystallinity and high upconversion efficiency. These particles were modified on surfaces by inorganic or organic polymers that meet criterion biocompatibility. The nanoparticles were characterized by a variety of physicochemical methods. The surface was further decorated with cell- adhesive RGD or cell-penetrating peptides and cellular uptake was observed by confocal microscopy. The particles were modified to enable their radiolabeling with $^{125}$I for in vivo biodistribution studies. The aims of the thesis are clearly and comprehensibly formulated in many individual points. I think, they could be summarized on several points

The chapter Results and Discussion gives an overview of the results achieved with reference to the publications outputs (Appendices 1-6). The author is always in the first place and her contribution on publication outputs is high (reported 50-60%). I am convicted, that the reviewers certainly helped to fine-tune the manuscripts with their recommendations and comments and reduced work of the reviewer of the thesis. The results of the work are well processed and logically sorted. I appreciate detailed description of chemical reactions accompanying the formation of nanoparticles, surface modification and their characterization. The author and her supervisor are surely pleased to have been able to prepare a new class of prospective biomimetic luminescent biomarkers. The test of the prepared materials in the biological environment is also an integral part of the work. Conclusions from these studies point to the right direction of research in this area and certainly helped to expand scientific knowledge in this field.

I have a few questions, comments, and topics to discuss.

Abstract – The first four sentences belong to another chapter (Introduction)

Synthesis of monodisperse nanoparticles, control of size distribution (page 23). Are you able to prepare monodisperse particles. Give explanation of terms monodisperse and uniform, please.

Synthesis of long-stable nanoparticles in biologically systems, page 30: "Naked" nanoparticles were coated with poly(ethylene glycol) /poly(oxyethylene)/ neridronate and contained according to TGA 20% of PEG. Have you observed the presence of crystalline phase of PEG? What do you think about the extent of surface modification of nanoparticles with higher/lower molar mass PEG.

In conclusion, I can state that the submitted work is well prepared and the above comments do not in any way reduce its high scientific level. Therefore, I recommend the work for the defense.

Prague, June 25th, 2018 prof. Ing. Jiří Brožek, CSc.