Master Thesis Proposal

Synthesis and Bioconjugation of Polysulfide Hybrid Nanoparticles

Supervisor: Narmin Suvarli M.Sc.

This proposal is based on the PhD project "Synthesis of hybrid nanoparticles via Aerosol Thiol-ene Photopolymerization" carried out at the Karlsruhe Institute of Technology by Early Stage Researcher/Doctoral Student Narmin Suvarli as part of the Marie Curie ITN PHOTO-EMULSION.

The synthesis of bioconjugated powder nanoparticles with tunable diameter using aerosol photopolymerization involves the preparation of the spray solution by combination of thiol and alkene compounds with photoinitiator and an organic solvent. Using the aerosol generator, the solution is sprayed forming aerosol droplets that enter the photoreactor. The aerosol droplets are irradiated with UV- lamps forming polymeric particles. For the purposes defined by the application of the resulting nanoparticles, i. e. bioanalysis, the size distribution of these nanoparticles has to be narrow and the diameter range has to be below 100 nm.

The following procedures are focused on producing hybrid nanoparticles using the same technique. The gold or silver nanoparticles are introduced to the spray solution at the first stage of the process. During atomization, the aerosol droplets with the gold/silver nanoparticles inside are formed. After the photoreaction, the polymer particles contain silver/gold nanoparticles. To make these particles suitable for bioanalysis several stages of bioconjugation should be performed. Due to the available SH groups on the surface of polymeric nanoparticles, the bioconjugation reaction can be realized using click chemistry. For the time being bio-linker of choice is maleimide. Maleimides are known to be good bioconjugating agents for thiols. To prove that the maleimide is attached to the nanoparticles, fluorescent dyes were used.

The workload of a potential master student will include the production of hybrid nanoparticles and performing the bioconjugation process. Step-by-step attachment of maleimide-biotin, streptavidin and other agents, i.e. anti-bodies, enzymes, peptides etc. This master project also includes analysis of the bioconjugated nanoparticles using Fluorescence Microscope, Scanning Electron Microscopy, Transmission Electron Microscopy etc.

The preferred starting date of the Master Project is December, 2019. Estimated end date - May, 2020. For all the necessary information, please contact:

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