A U S H A N G

FREIE UNIVERSITÄT BERLIN

Fachbereich Physik

Arnimallee 14, 14195 Berlin

D I S P U T A T I O N

Freitag, 16. Juli 2021, 13:00 Uhr

WebEx

Disputation über die Doktorarbeit von

Herrn Pierre Volz-Rakebrand

Das Thema der Arbeit lautet:

Exploring interactions between biological matter and dendritic nanoparticles through the application of fluorescence lifetime probes

Die Arbeit wurde unter der Betreuung von **Prof. Dr. U. Alexiev** durchgeführt.

Abstract: The lack of information on interactions between nanoparticles and the plethora of biomolecules poses one of the greatest challenges for the clinical translation of nanomedicine. In order to shed some light on these interactions, this disputation talk presents the development and application of time-resolved fluorescence spectroscopy and imaging approaches for polymeric nanoparticle systems and apply them to diverse in-vitro and ex-vivo test systems. The fluorescence lifetime defines the characteristic decay time of the excited electronic state of a fluorescent probe. On the one hand, it can be considered a parameter independent of fluorophore concentration, fluorescence intensity, or detection efficiency. On the other hand, fluorescence lifetimes can be sensitive to certain parameters of the physicochemical environment of a fluorescent probe, such as temperature, pH, steric restrictions, viscosity, polarity, or molecular interactions. By applying fluorescence lifetime probes, the scope of fluorescence read-outs can be extended to monitor biological nanoparticle interactions. Here, a fluorescent molecular rotor probe is applied to investigate molecular interactions between a polymeric nanoparticle and biomolecules like the protein corona forming serum albumin. In a next step, this gained fluorescence lifetime sensitivity of the nanoparticle-probe-conjugate is expanded in a fluorescence lifetime imaging microscopy (FLIM) approach to living cells interacting with polymeric nanoparticles. Based on distinct changes in fluorescence lifetime parameters, unknown cellular targets were identified and interpreted. Finally, multiphoton excitation enables live-tissue FLIM tomography of the nanoparticle's interactions in tissue. This shows significant differences in the interaction modes of the polymeric nanoparticle with tissue in healthy and diseased state.

Die Disputation besteht aus einem Vortrag und einer angrenzenden Aussprache.

Der Vortrag ist öffentlich.

Interessierte werden hiermit herzlich eingeladen

Der Vorsitzende der Promotionskommission

Prof. Dr. R. Netz