SUMMARY

of the doctoral dissertation entitled: "Silver nanowires as platforms for plasmonically enhanced fluorescence biosensing"

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Silver nanowires can be considered as a bridge between the *micro* world and the *nano* world. On the one hand, thanks to their average length of about 10 μm, they are visible with an optical microscope. On the other hand, they exhibit plasmon resonance, thanks to diameters of about 100 nm. The additional advantage of silver nanowires concerns flexibility with their surface modifications with on-demand functional groups. The synthesis of silver nanowires is simple, fast, and the obtained nanostructures remain stable over months.

The scientific focus of this dissertation was to experimentally demonstrate the potential of silver nanowires as a plasmonically enhanced fluorescence sensoric platform for the detection of single proteins. In this study, functionalized silver nanowires were tested for the detection of the photoactive protein peridinin-chlorophyll-protein, used as a model complex. Through the series of well-designed experiments, the optimized configuration of silver nanowires in the context of applications in biosensorics has been elucidated. For measurements, a fluorescence wide-field microscope was used to record kinetics of fluorescence intensity maps. In the initial experiment, incubation of proteins with silver nanowires in solution was tested. Subsequent stages focused on experiments where silver nanowires were deposited on a substrate. These included a novel method for orienting and attaching silver nanowires to the surface in a microfluidic channel. Protein detection by silver nanowires both embedded in the channel and in a plasmonic chip configuration was tested. Importantly, the orientation of silver nanowires and their surface functionalization have been shown to facilitate measurements and enable efficient protein detection using a wide-field fluorescence microscope. In addition, plasmonic enhancement of protein fluorescence was demonstrated and detection limits were determined. The conducted studies have shown that silver nanowires can be successfully used as plasmonically active biosensor platforms.

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