Project 3.11 Controlling chirality in nanoplasmonic waveguides via spin-momentum locking: from spectral tunability to sensitive detection of enantiomers and efficient generation of spin polarization

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Background:

Compounds that make up our bodies, such as amino acids, proteins, sugars, DNA and RNA, and hormones that we produce, exhibit chiral properties. Chirality is a property of asymmetric molecules that do not have a symmetry plane or center of symmetry, they are the so-called optical "opposites". They twist the plane of polarized light differently, due to the different spatial arrangement of their small fragments. Circular dichroism is used as a standard method in pharmacy to study the twisting of light by optically active molecules. This phenomenon involves measuring the difference in absorption of right and left circularly polarized light by molecules. These measurements usually require large volumes of solution. In the project we will construct a nano-device for such measurements base on silver nanowires. Silver nanowires are unique structures, with a diameter in the order of 100 nm, that, despite being nanoparticles, are visible under an optical microscope and hence can be quite easily arranged on a substrate.

Aim:

The scientific goal of this project is to design and construct a nanophotonic system based on tailored spatial arrangement of plasmonic nanostructures for efficient spin–momentum coupling.

Requirements:

- The PhD candidate should have good knowlegde about metallic nanopartcile synthesis and microscopic methods,
- MSc or equivalent in chemistry, physics or a related area