Bachelor or Master Thesis

Metallic Spirals for Giant and Broadband Nonlinear Chiroptical Effects

This thesis aims at nonlinear chiroptical effects of 3D chiral nanoparticles, a cutting-edge research topic in ultrafast nonlinear optics and nanophotonics, which involves nanofabrication advances, linear and nonlinear ultrafast optical spectroscopy, and fundamental physics.

Thesis topics include:

- Nanofabrication of 3D spiral-type gold nanostructures using hole-mask colloidal lithography or electron-beam lithography
- Experimental study of second- and third- harmonic generation with femtosecond lasers depending on the handedness of fundamental light as a function of wavelength (SHG/THG circular dichroism)
- Nonlinear chiroptical effects of spirals made of other plasmonic materials such as silver, copper, magnesium, *etc*.
- Nonlinear chiral sensing based on the abovementioned findings

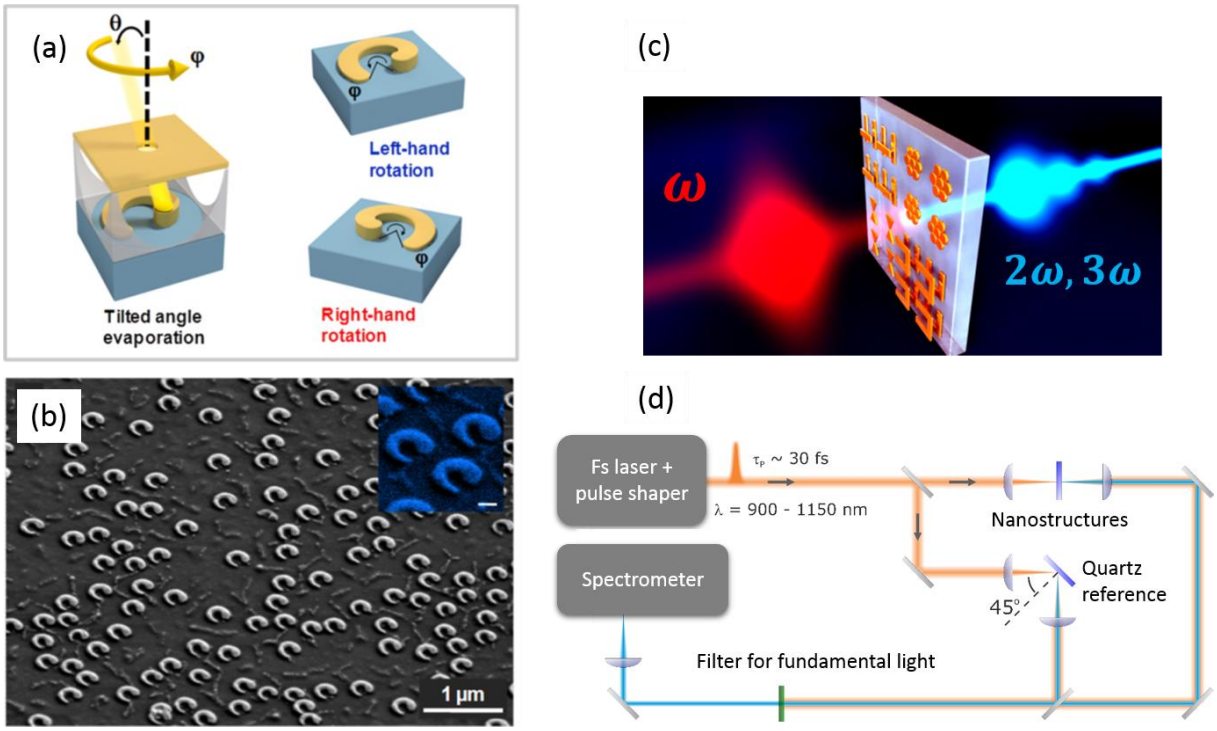

Figure 1. (a) Schematic of colloidal nanohole lithography for fabrication of left- and right- handed gold spirals. (b) Scanning electron microscopy of left-handed gold spirals. (c) Schematic of nonlinear plasmonics. The nanostructures convert fundamental light to second- or third- harmonic nonlinear signals efficiently. (d) Schematic of our nonlinear spectroscopy setup. A wavelength-tunable ultrafast laser source is used. Based on optical parametric processes, the wavelength can be extended to 1900 nm.

This project is financially supported by the Carl-Zeiss Foundation. Anyone with the following prerequisites is very welcome:

- Interested in frontier topics on ultrafast optics and nanosciences
- Basic knowledge on chemistry and optical experiments

Contact:
Dr. Lili Gui Tel.: +49 (0)711 685-64962 E-Mail: l.gui@pi4.uni-stuttgart.de