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Chiral plasmonic effects probed at the single-nanoparticle level

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Metallic nanoparticles are keystones for the development of nanoprobes due to their Localized Surface Plasmon Resonance (LSPR) which may present an anisotropic feature if the nanoparticle or its direct environment is anisotropic [1]. This property can be exploited to probe environment, especially the circular anisotropy of a chiral surrounding medium. Moreover, this chiral environmental response can be enhanced, due to the hot spots around the nanoparticle at resonance [2]. The development of chiral nanoprobes to detect enantiomeric excess at the nanoscale is still a challenge which requires developments of new technics in optics dedicated to polarization measurements.
Here we report on the development of a new setup combining polarization modulation with spatial modulation spectroscopy (SMS) [3] to investigate the anisotropic response of individual nano-objects. We first show evidence that the anisotropy of dimers of 50 nm-radius gold nano-spheres can be totally characterized with this setup.
Influence of the geometry of chiral gold nano-objects (GNO) on the circular dichroism they exhibit is then investigated through numerical calculations and compared to preliminary experimental results on GNO produced by nanolithography. In the near future, this new setup will permit to investigate the coupling between GNO and chiral molecules.

[1] Collins et al., Adv Opt Mater, 5, 1700182, 2017
[2] Zhai et al., Nanoscale, 7, 10690, 2015
[3] Billaud et al., RSI, 81, 43101, 2010

Choix de session parallèle

5.3 SFO: Metamatériaux, plasmonique

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