CD sensing using HMCL fabricated plasmonic nano-particles

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Plasmonic metal nano-particles (NPs) with their localised electron oscillations (LSPR) are commonly used for bio-sensing applications, e.g. as refractive index sensors. Due to its high electron density and low reactivity gold is often the material of choice for plasmonic applications like the sensitive detection or quantification of macromolecules such as proteins [1]. When it comes to conformational analysis of proteins the standard circular dichroism approach (CD) is known to require comparably high concentrations, which are not always feasible. A promising way of tackling this problem is to enhance CD sensitivity using the field-enhancement properties of plasmonic NPs.

Here I present two different approaches for enhancing CD sensitivity using plasmonic NPs. The first utilizes aluminium as the plasmonic material. Allowing for plasmonic resonances in the ultra-violet spectral region (UV) [2], this enhances sensitivity in the for protein conformational analysis relevant spectral region. It is also a promising candidate for the recently developed method of superchiral spectroscopy [3]. The second approach utilizes chiral gold nano-hooks (see fig. 1) with plasmonic resonances in the visible spectral region, for unpolarized light as well as for CD measurements, especially showing higher sensitivity for the latter. Furthermore, using gold as NP material allows for an easier functionalization of its surface. Both approaches are realized by the means of the fast and inexpensive bottom-up method of hole-mask colloidal lithography (HMCL) [4].

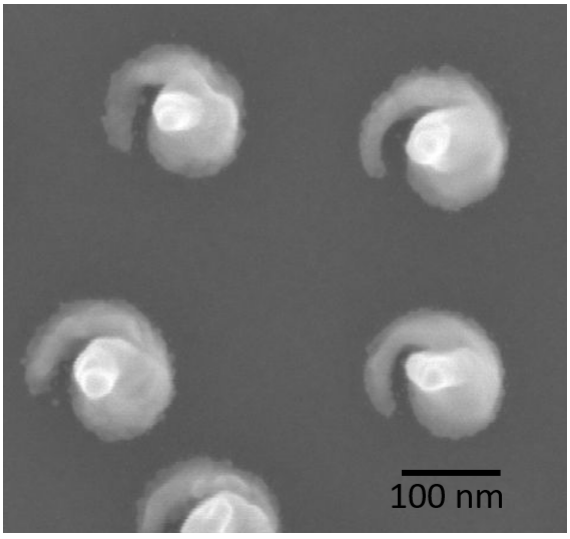

Figure 1: SEM image of chiral Au nano-hooks on Si.

References:
[1] Guerreiro, J. R. L. et al., ACS nano, Vol. 8, No. 8, 7958-7967 (2014).
[2] M. H. Chowdhury et al., Anal. Chem., Vol. 81, No. 4, 1397–1403 (2009).
[3] Hendry, E. et al., NNANO, Vol. 5, 783-786 (2010).
[4] Frederiksen, M. and Sutherland, D. S., Nanoscale, Vol. 6, No. 2, 731-735 (2014).