Chiral gold nano-hooks for increased LSPR sensitivity

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Plasmonic nanoparticles (NP) with their localised electron oscillations (localised surface plasmon resonance, LSPR) constitute a common tool for sensitive refractive index sensors [1]. A new approach using chiral NPs in combination with circular dichroism (CD) spectroscopy shows promising results for increasing the sensitivity of this method.
In contrast to the standard fabrication method of chiral NPs which utilizes layered electron-beam lithography [2] the present hooks are fabricated using a faster and cheaper bottom-up approach called hole-mask colloidal lithography (HMCL) [3].
HMCL is based on the self-assembly of charged nano-spheres on a sacrificial layer for the creation of a hole-mask. Here I report how this hole-mask can be combined with glancing-angled physical vapour deposition (GLAD-PVD) for achieving a simple way of making chiral NPs. Crucial to this novel method is the exploitation of the clogging of the hole-mask during deposition [4]. When depositing material while simultaneously tilting and rotating the sample this clogging straightforwardly leads to the formation of the here presented nano-hooks.
Measuring the spectral absorbance of these Au nano-hooks (see fig. 1) reveal multiple plasmonic responses that correspond well to previous results for other Au NPs [1]. Furthermore, CD absorbance measurements show differential shifts of the resonance peaks when comparing the two handedness of circular polarization. These shifts appear to be more sensitive to the surrounding refractive index than the standard (unpolarized) spectroscopic approach.
Therefore, these novel NPs are a promising instruments for improved sensitivity of LSPR-biosensors, with high sensitivity and a cost- and time-efficient fabrication method.

References

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Figures

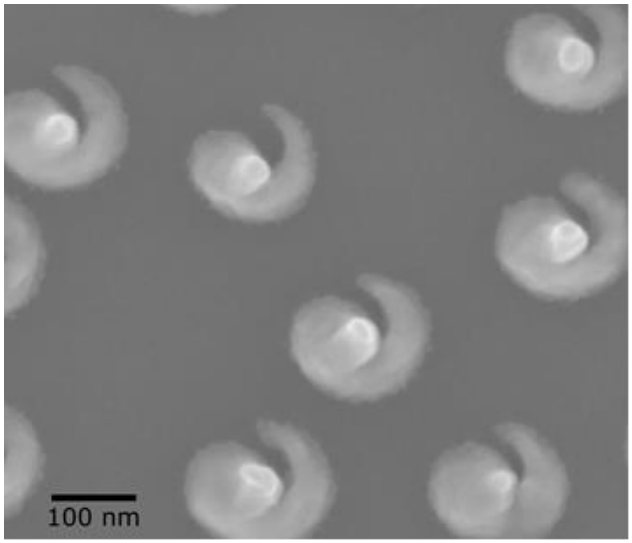

Figure 1: Scanning electron microscope image of chiral gold nano-hooks.