

Grating metasurfaces as directional plasmon sources: applications in achiral and chiral sensing

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Optical biosensing is currently a highly active research area, particularly with respect to chiral compounds [1], where an increasing demand of highly selective, sensitivity-enhanced and low-cost devices has been noted. Plasmonic devices have risen as an alternative approach to conventional methods [2].

Our work focuses on the use of gold diffraction gratings to excite Surface Plasmon Polaritons (SPPs), using their intensity to characterize relevant features of the sample, such as their refractive index and their chirality.

We will present our current research on these devices. Using computational FDTD methods we demonstrate the capabilities of a gold grating to detect small changes in the refractive index of analytes upon wavelength interrogation, with a sensitivity up to 1500 nm/RIU [3]. Furthermore, we shall show its ability to excite plasmons directionally at non-normal incidences.

Then, using a hybrid dielectric-gold system, we demonstrate how the directional plasmon approach characterized in other works [4] can be applied to chiral sensing, with a structure that offers chiral enhancement in both the near and far field regimes, while presenting high-dissymmetry areas available to analytes.

References

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- [2] Striebel, C., Brecht, A. and Gauglitz, G. *Biosens. Bioelectron.*, **9**, 2(1994), 139–146.
- [3] González-Colsa, J., Serrera, G., Saiz, J. M., González, F., Moreno, F. and Albella, P. *Optics Express*, **29**, 9 (2021) 13733-13745.
- [4] Lin, J. et al., *Science*, **340**, 6130 (2013) 331-334.

Figures

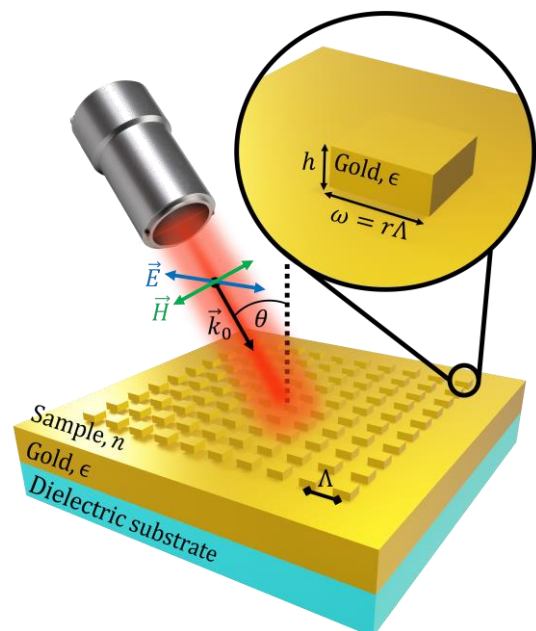


Figure 1: Operation diagram of the gold grating device for refractive index sensing.

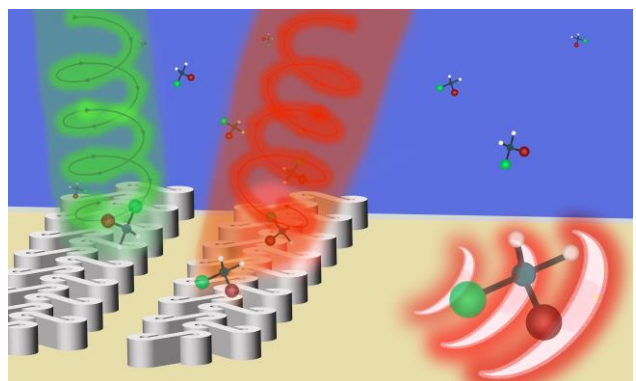


Figure 2: Operation diagram of the hybrid metasurface for chiral sensing.