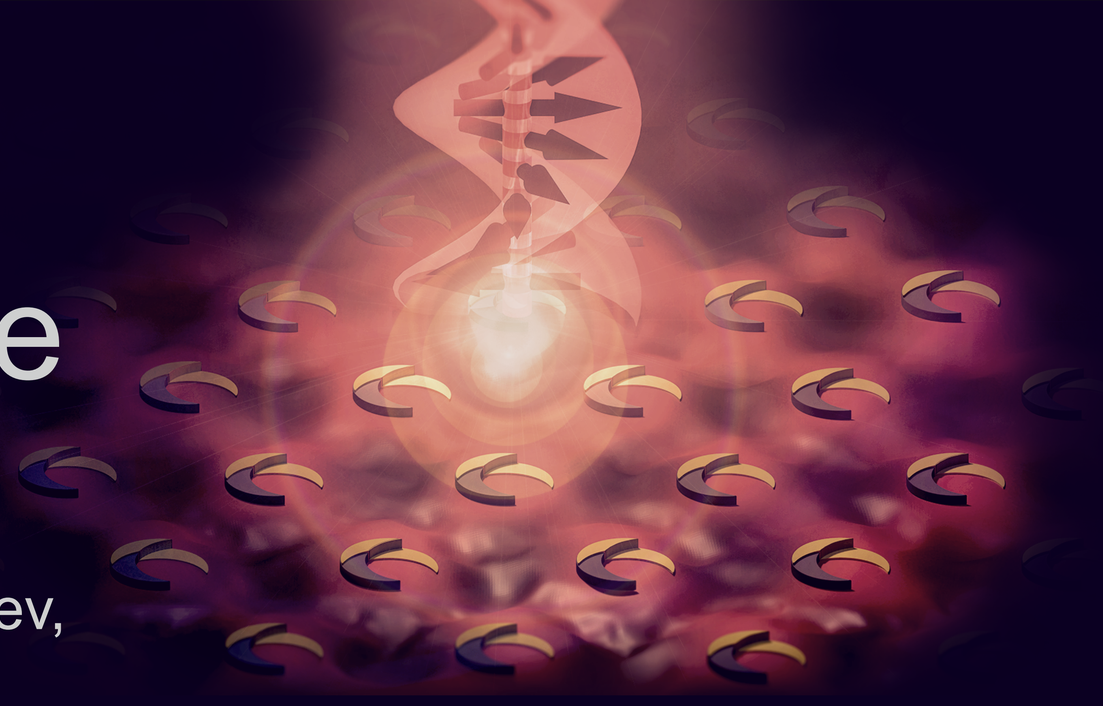
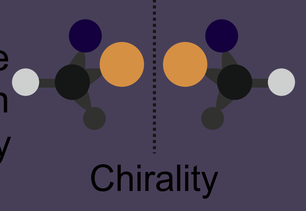
Chiral Lattice Surface Resonances (cSLR)

E. S. A. Goerlitzer, R. Mohammadi, S. Nechayev,
K. Volk, M. Rey, P. Banzer, M. Karg, N. Vogel

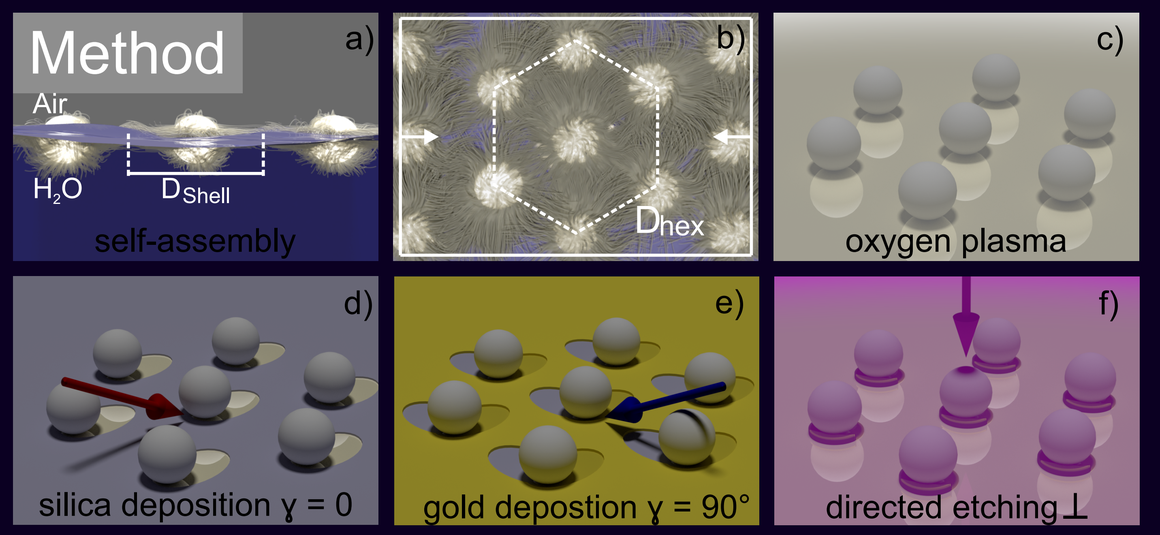


Motivation

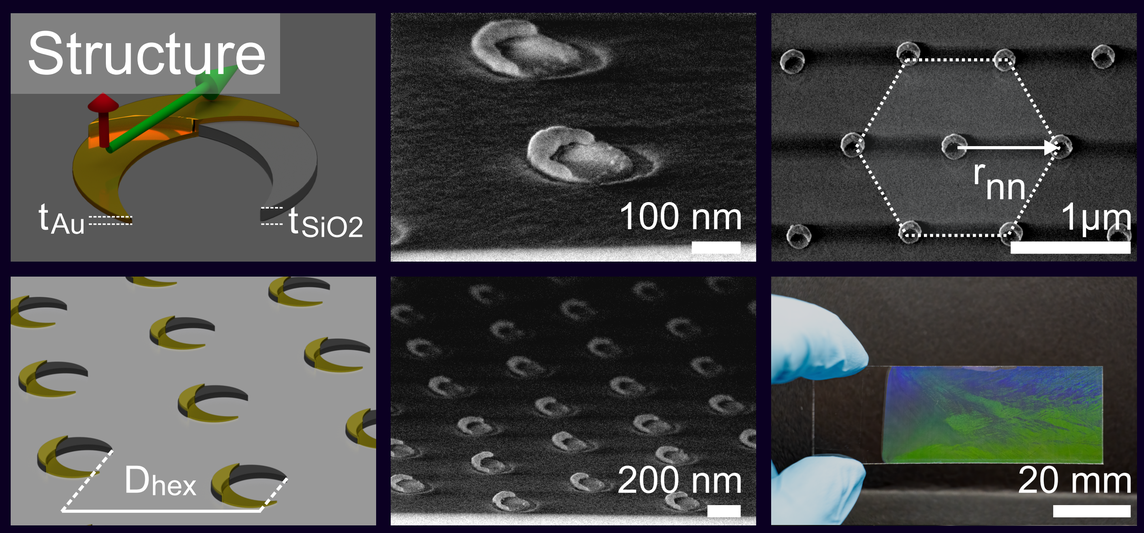
- Coupling localized surface plasmon resonances (LSPRs) to grazing diffraction orders leads to surface lattice resonances (SLRs) with narrow line width.[1,2,3]
- Here, a new degree of freedom of surface lattice resonances is added by making their excitation handedness-dependent.[4] We achive this by using true chiral 3D crescents.[5]
- We invistigate the requirements in simulations and show the excitation in an experiment by emplyoing self-assembly of core-shell particles[6] and colloidal lithography.[5]



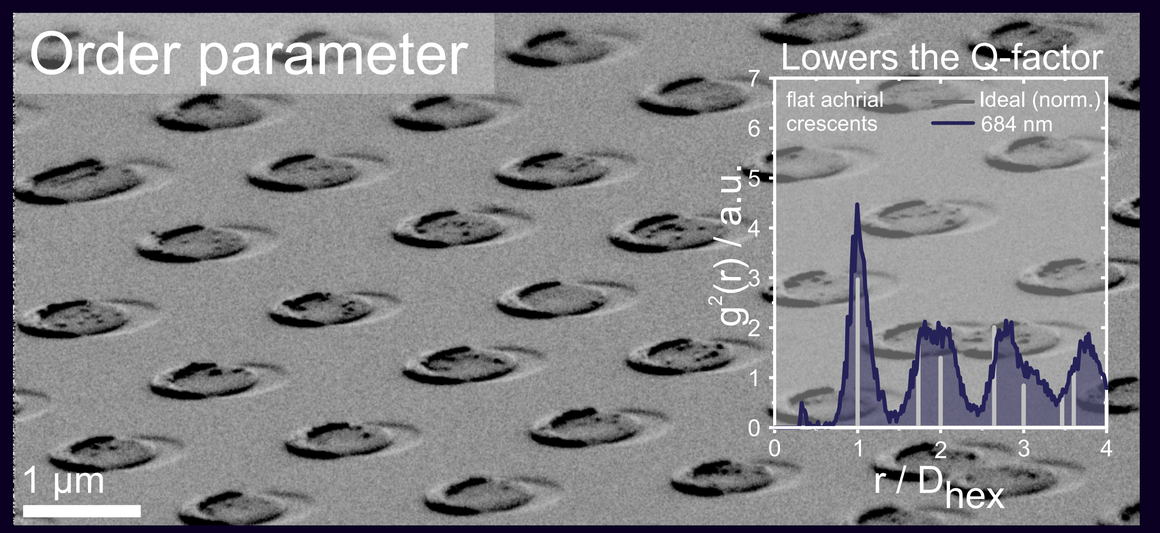
Method



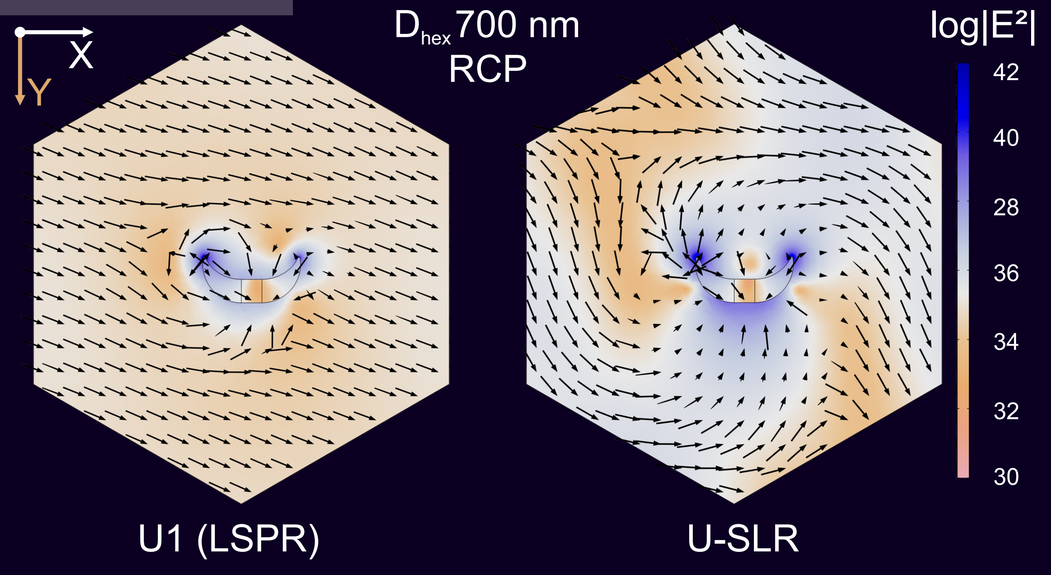
Structure

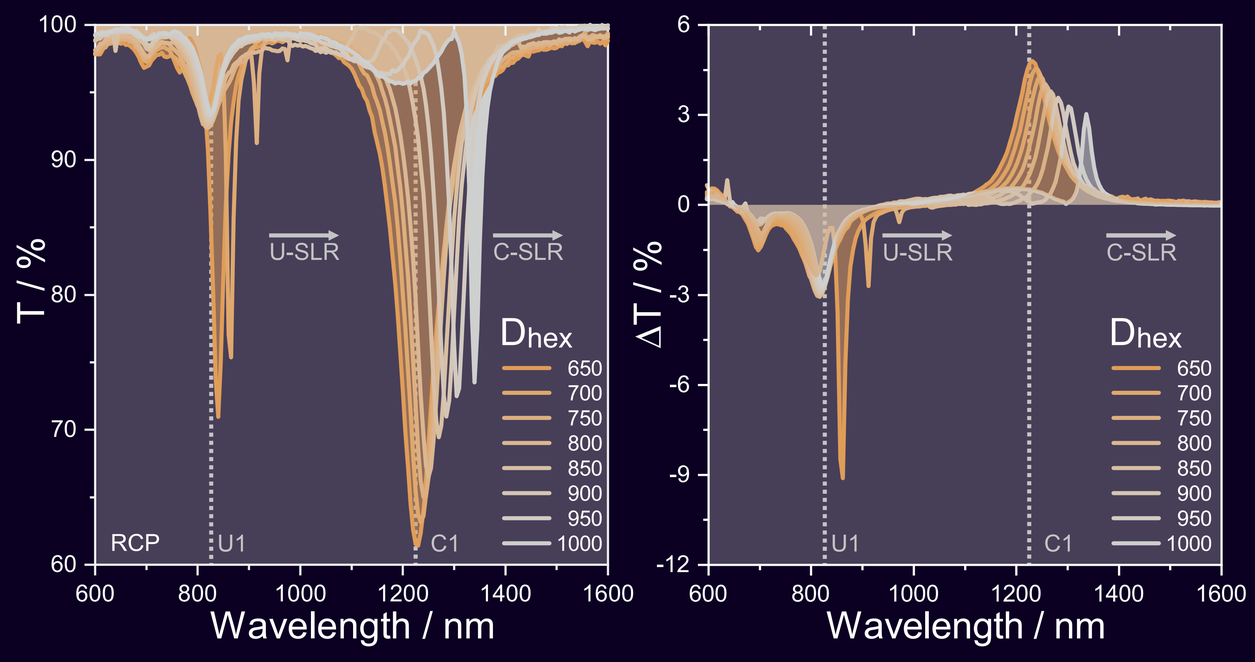


Order parameter



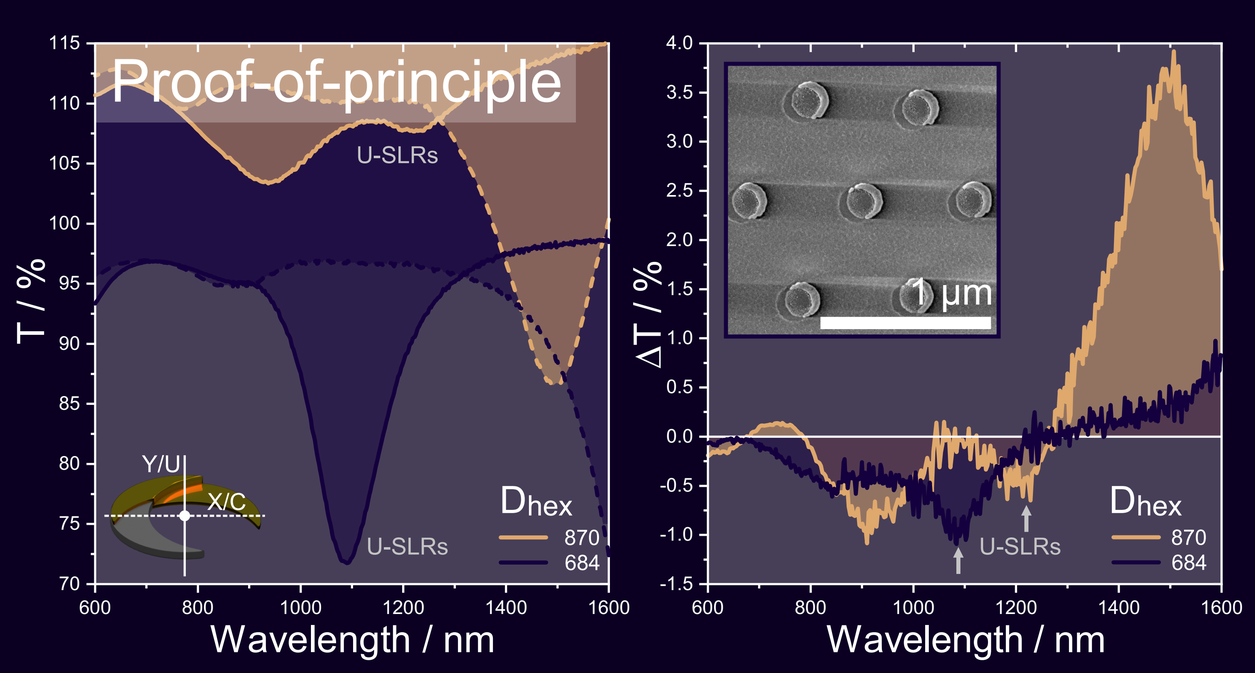
Simulation





Conclusion and Outlook

- The large lattice constants feature spectrally overlapping in-plane diffraction modes and localized surface plasmon resonances.
- Using chiral crescents as building blocks in an hexagonal array does not alter the diffractive properties of the system.
- The chiral nature of the building blocks, however, leads to the excitation of intrinsically chiral SLRs that selectively respond to the handedness of incident circularly polarized light.
- The presented chiral 3D-metasurfaces may find applications in enhanced chiral sensing, handedness-selective coupling to guided modes, control of circularly polarized fluorescence emission, or the design of polarization-selective mirrors.



Heinrich Heine Universität Düsseldorf
MAX PLANCK INSTITUTE for the science of light
FRIEDRICH-ALEXANDER UNIVERSITÄT ERLANGEN-NÜRNBERG
ERLANGEN
@VogelLab
vogellab.de

1 V. G. Kravets et al. Chem. Rev. 2018, 118, 5912
2 Y. Lin et al. Adv. Funct. Mater. 2019, 29, 1904157
3 M. J. Huttunen J. Opt. Soc. Am. B 2019, 36, E30
4 E.S.A. Goerlitzer et al. Adv. Mater. 2020, 2001330
5 E.S.A. Goerlitzer et al. Adv. Opt. Mater. 2019, 7, 1801770
6 J. S. J. Tang, R. S. Bader et al. ACS Omega 2018, 3, 12089