CONTRATOS PREDOCTORALES 2022 SEVERO OCHOA

PROJECT TITLE / JOB POSITION TITLE:

Chiral plasmonic metasurfaces to control light emission

JOB POSITION RESEARCH LINE:

RL1 – Sustainable Energy Conversion and Storage Systems

RESEARCH PROJECT / RESEARCH GROUP DESCRIPTION:

Circularly polarized light exhibits promising applications in future displays and photonic technologies. However, the optical components (quarter wave plates, polarizers, etc) required to generate this polarization state from conventional light sources involve severe brightness losses and hinder further device miniaturization. Circularly polarized luminescence (CPL) from chiral luminophores is an ideal approach to directly generate circularly polarized light, in which the energy loss induced by the circularly polarized filters can be reduced. CPL-active materials originate from the combination of chiral environments (chiral molecules or asymmetrical environments) and luminescent units. A great effort is being placed at the synthetic stage to obtain these CPL active materials, however the amount of circular PL produced is still limited.

In this project, we propose the use of photonic chiral metasurfaces to directly produce CPL from conventional light emitters. In particular, we will fabricate scalable chiral metasurfaces whose optical properties will modulate the emission from the emitter of choice. Our approach is inexpensive, does not increase the overall thickness of the device while it can be seamlessly combined with many devices and materials. Furthermore, chiral metasurfaces (arrays of chiral elements) are also employed for sensing, cell aligment and catalysis, which illustrates the vast number of applications of these structures.

JOB POSITION DESCRIPTION:

In this position the researcher will become familiar with the field of plasmonics and how these structures can be used to control light-mater interaction. The student will learn to design and optically characterize the metasurfaces fabricated during the project. An innovative aspect of the project is that we use a scalable approach to fabricate plasmonic structures with high

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quality which facilitates the implementation of these metasurfaces in different devices and with different materials. Our scalable nanofabrication approach also brings the opportunity for many collaborations with other groups and topics.

The topics involved in the project are physics, chemistry, engineering and the students are encouraged to become familiar with a bit of them. We are an interdisciplinary group, where physicists, chemists and engineers collaborate in a friendly environment. we also have scientific collaboration with relevant groups in the field, that will act as possible internship secondments to the student.

Any previous knowledge working and assembling optical set ups would be appreciated but is not necessary.

GROUP LEADER:

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RELATED LINKS TO THE POSITION (optional)

URL: https://onlinelibrary.wiley.com/doi/pdf/10.1002/adom.202100378
Tittle link: beginners guide to chiral plasmonics