BIOINSPIRED PHOTONIC POLYMERIC SENSORS FOR ANALYSING EXOSOMES

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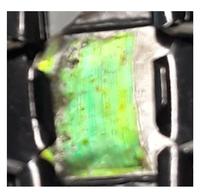
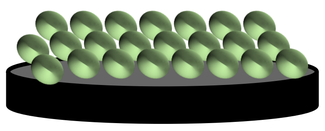
Introduction

Extracellular vesicles (EVs) are membrane-enclosed particles that travel through body fluids carrying signalling factors, structural proteins, lipids and nucleic acids. EVs are classified as exosomes, if resulting from the lumen of multivesicular bodies (1). Exosomes are known to participate in physiological processes but are also correlated with several cancers (2). Particularly, astrocyte-derived exosomes (AS-Exo) and their microRNA cargo have a role in promoting breast cancer metastasis (3). Despite their potential as disease biomarkers, there are still many technical challenges in exosome isolation and content profiling. Thus, this project presents new approaches based on colored photonic materials as label-free sensing layers integrating selective recognition elements, such as molecularly imprinted polymers and oligonucleotides. Moreover, the plan also allies naturally derived biomaterials, which are biocompatible and amenable to functionalization.

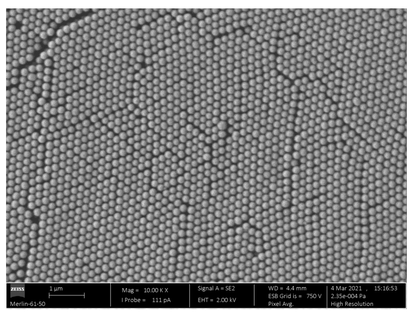
Methodology

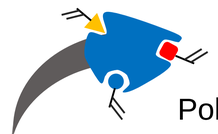
Colored photonic materials as label-free sensing layers



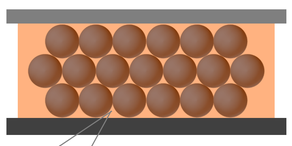


3D photonic crystal by colloidal self-assembly

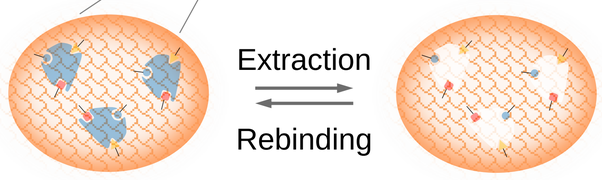




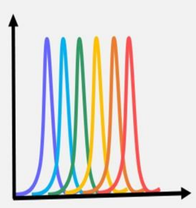
Polymer infiltration containing the target biomolecule



High affinity cavities

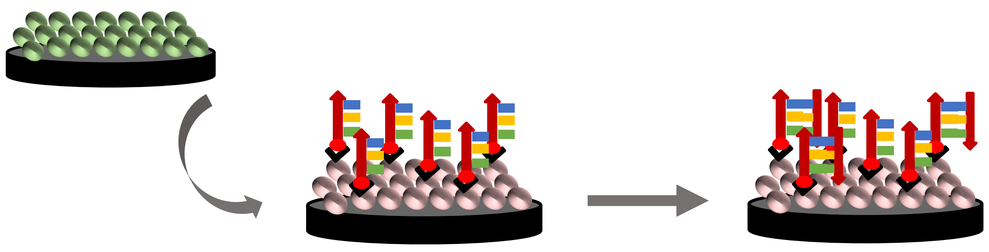


Molecular imprinting-based biosensors



Reflectance spectra

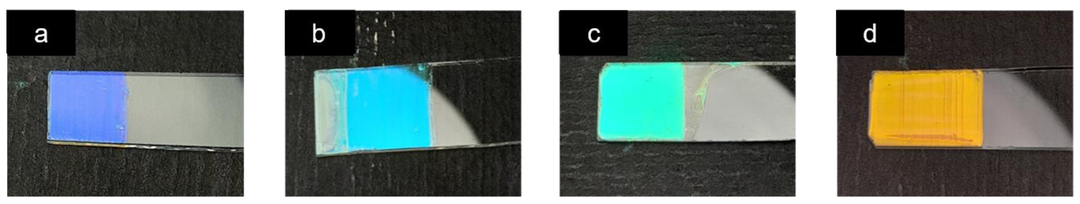
Naked eye detection

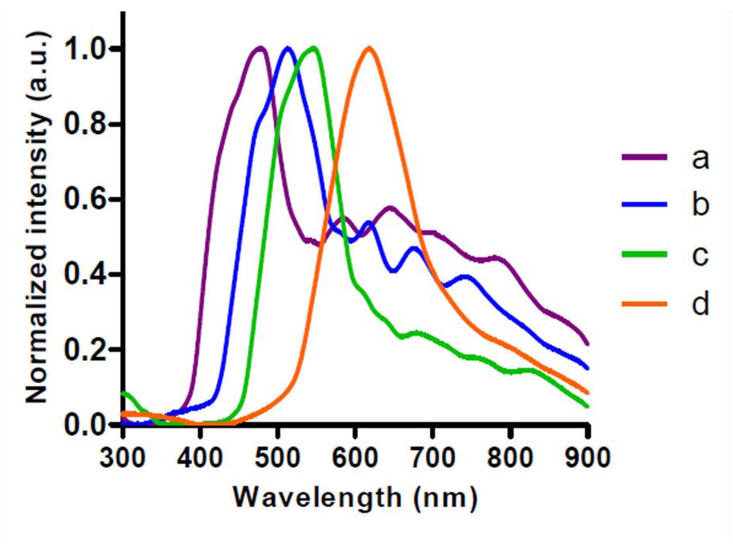


Oligonucleotide-based biosensors

Results

Silica nanoparticles (SiNPs) synthetized based on the Stöber method





SiNPs diameter based on dynamic light scattering measurements

Protocol	Diameter (nm)
a	235.3
b	264.8
c	275.0
d	285.8

General considerations

- Research in photonic polymer materials and their use in optical biosensors is rapidly expanding the prospective point-of-care applications.
- Photonic materials allow inexpensive, miniaturized, specific, easy-to-use biosensors.
- Biomimetic recognition elements have the advantage of being stable and resistant to a wide range of conditions.

References

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Acknowledgments

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