



ERASMUS MUNDUS



## **MASTER IN PHOTONICS – “PHOTONICS BCN” ERASMUS+ “EUROPHOTONICS”**

### **MASTER THESIS PROPOSAL**

**Dates: April - September 2019**

**Laboratory : Clean Room, CNRE**  
**Institution: UPC, MNT Group**  
**City, Country : Barcelona, Spain**

**Title of the master thesis:** Development of a new technology to build colloidal crystals for negative index applications

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**Keywords: colloidal crystal, bragg mirrow, negative index**

### **Abstract**

Electrospray is used for a device that employs electricity to disperse a liquid or for the fine aerosol resulting from this process. Our group has recently developed a novel way of electrospaying 3D ordered nanostructures (figure 1) (patent number P201131081). Applications in colloidal crystals and photovoltaics have been already tested, but there is a wide range of applications in fabricating novel electronic devices, like the nano-based ultracapacitors, nano-MOSFETs and other surface patterned devices.

In this work application of colloidal crystals to more sophisticated structures like layers of different nanosphere diameters will be performed by using the electro spray technique. This structure will imitate a chirped mirror leading to a structure designed to reflect varying wavelengths of lights between the layers (stack).

The fabrication process steps will take place in a Clean Room, and in the facilities of the Micro and Nanotechnologies Group in the Campus Nord, UPC, Barcelona. Characterisation will be made in the CRNE, at the Campus Diagonal Besòs, Barcelona.

### **Objectives**

- Learning electro spray technique.



methods.

- Deposition of different materials.
- Deposition of different nanosphere sizes. Analysing the order.
- SEM and reflectance measurements.

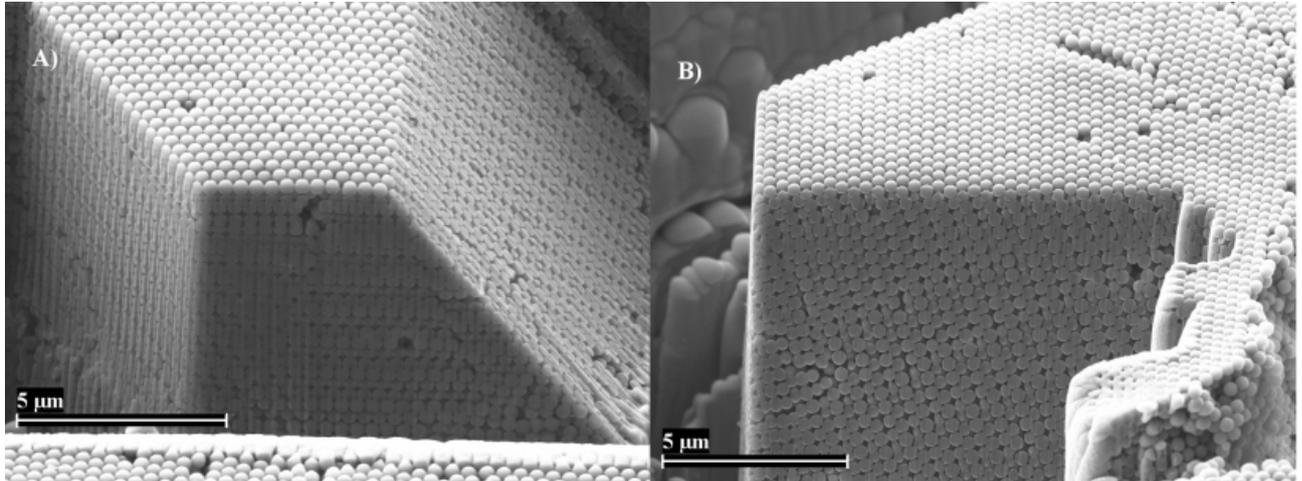


Figure 1: (a) Polystyrene colloidal crystal with 380nm nanoparticles, the total thickness is 20  $\mu\text{m}$ . (b) Tilted cut showing the order of the polystyrene colloidal crystal in different plane directions