

RAYLEIGH BLUE COLORED MATERIALS: ELABORATION, MODELING AND CORRELATION BETWEEN STRUCTURE AND PHYSICAL COLOR

LABORATORY : Institut Lumière Matière
IN COOPERATION WITH : Laboratoire de Chimie de Lyon, ICL-ENS Lyon

LEVEL : M2
TEAM(S) : MMCI
MNP

CONTACT(S) : PILLONNET Anne

CONTACT(S) DETAILS: anne.pillonnet[at]univ-lyon1.fr / Tel. 0472431120

KEYWORD(S) :

SCIENTIFIC CONTEXT :

The development of structural colors without chemical pigments respond to environmental and economic issues, in particular to meet increasingly restrictive standards. Their development requires fundamental studies to control and implement the link between the structuring of the material and its coloring. Indeed, structural colors are the product of the interaction of light and the structuring of matter at the wavelength scale. They involve the modification of the incident electromagnetic field by classical physical optical processes such as interference, diffraction, scattering or polarization. In this internship, the candidate will study structural colors, which are related to the disordered dispersion of nanometric particles in a transparent matrix. It is a phenomenon, very present in nature, which gives its color to the sky but also their colors to many living organisms (feathers, wings, iris of the eye, plants etc.). The in-depth understanding and mastery of the obtaining of this color is also an issue in the field of art history to better understand what were the knowledge and techniques used in master easel paintings at the time of the Renaissance, before the advent of chemical pigments.

MISSIONS :

The effect of light diffusion on the obtaining of color will be analyzed according to two approaches: a mathematical approach by modeling the light transport in scattered material systems and, an experimental approach by analyzing materials (films or solid) elaborated by soft chemistry.

For this internship, the candidate will benefit from the experience of the "Photonic materials and nanostructures" team which has been working on Rayleigh blue staining for 5 years in the framework of a research-creation project . He will benefit from the numerical modeling expertise of the "Condensed Matter and Interface Modeling" team at ILM with experience in optical diffusing disordered media for other applications . For the elaboration of samples by soft chemistry, the candidate will benefit from the co-supervision of the team "Functional Materials and Photonics" of chemistry laboratory of ENS-Lyon whose expertise is widely recognized in the field .

The candidate will have a background in optics, materials and numerical simulations.

OUTLOOKS :

This subject is intended to continue on a thesis topic.

BIBLIOGRAPHY :

Anne Goyer, Amina Bensalah-Ledoux, Davy Carole, Cécile Le Luyer, Tiphaine Blanchard, Isabelle Merdrignac, Isabelle Guibard, Anne Pillonnet , Arts et Sciences, 2, 3 (2019) DOI : 10.21494/ISTE.OP.2019.0423

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S. Parola, B. Julian-Lopez, L. D. Carlos, C. Sanchez, Adv. Funct. Mater. 26 (36), 6506-6544 (2016)