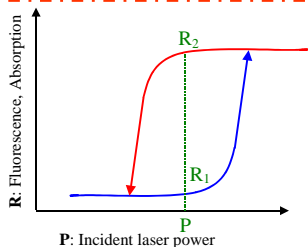
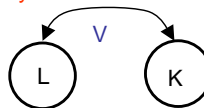


Matrices hybrides nanostructurées permettant le contrôle dimensionnel de paires d'ions métalliques pour la bistabilité optique intrinsèque

What are we looking for?



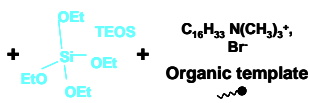
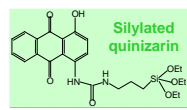
Two systems in interaction: pair of ions



Synthesis : a two-step process

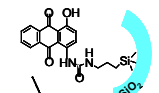
1. Anchoring of the quinizarin molecules at the film

One-pot synthesis via Evaporation Induced Self Assembly by dip-coating



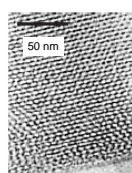
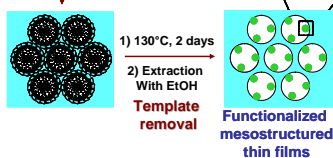
Molar ratio
1 TEOS : 15 EtOH :
0.004 HCl : 5 H₂O :
0.10 CTAB : 0.01 quinizarin

Controlled H₂O
EtOH / HCl
Self assembly

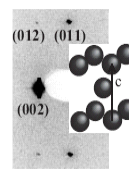


Advantages of the one-pot synthesis :

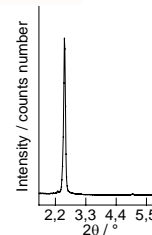
- Functionalization and structuration take place at the same time
- Homogeneous distribution of the organic molecules
- Stoichiometry of the thin film = composition of the initial solution



TEM



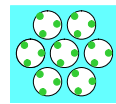
GISAXS experiments
SAXS beam line ELETTRA
Trieste, Italy



SAXS
Bragg-Brentano
configuration

2. Complexation of the Eu³⁺ ions by the chelate quinizarin ligands

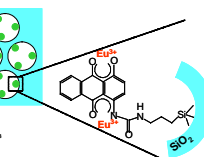
by soaking the functionalized films in Eu³⁺ precursor solutions



Eu(NO₃)₃
or
Eu(acac)₃
or
EuCl₃
Alcoholic
Solutions (10⁻⁴ M)



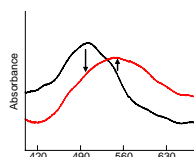
Complexation
One night



Eu³⁺ complexation

— Before soaking the hybrid thin film in Eu³⁺ solution

— After soaking in Eu³⁺ solution

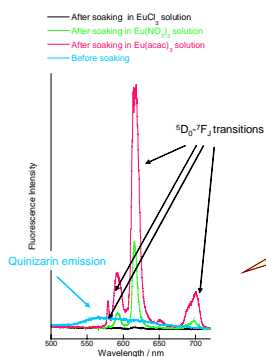


One or two Eu³⁺ per quinizarin ?

→ RBS experiments in progress (N/Eu³⁺ ratio)

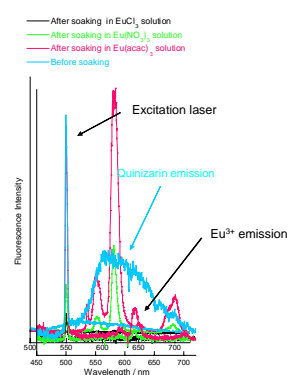
Optical properties

✓ Emission spectra after excitation at 465 nm (⁷F₀? ⁵D₂ transition)



✓ ⁷F₀ lifetimes in mesostructured films ≈ 0.3-0.2 ms for all Eu³⁺ precursors

✓ Emission spectra after excitation at 500 nm (quinizarin absorption, outside Eu³⁺ absorption)



Conclusions and prospects

- ✓ Preparation of 3D organized mesoporous thin films with quinizarin-Eu³⁺ complexes
- ✓ Quantum efficiency of Eu³⁺ emission ≈ 30 % for all precursors
- ✓ Strong dependence on precursors of Eu³⁺ concentration in the films (coordination sphere)
- ✓ Weak energy transfer between quinizarin and Eu³⁺
- ✓ Effect of the porosity organization on optical properties ?
- ✓ Other molecular chromophores and lanthanides
- ✓ Study of lanthanides pair interactions

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