

Heteronuclear lanthanide-based coordination polymers with Boronic acid as ligand

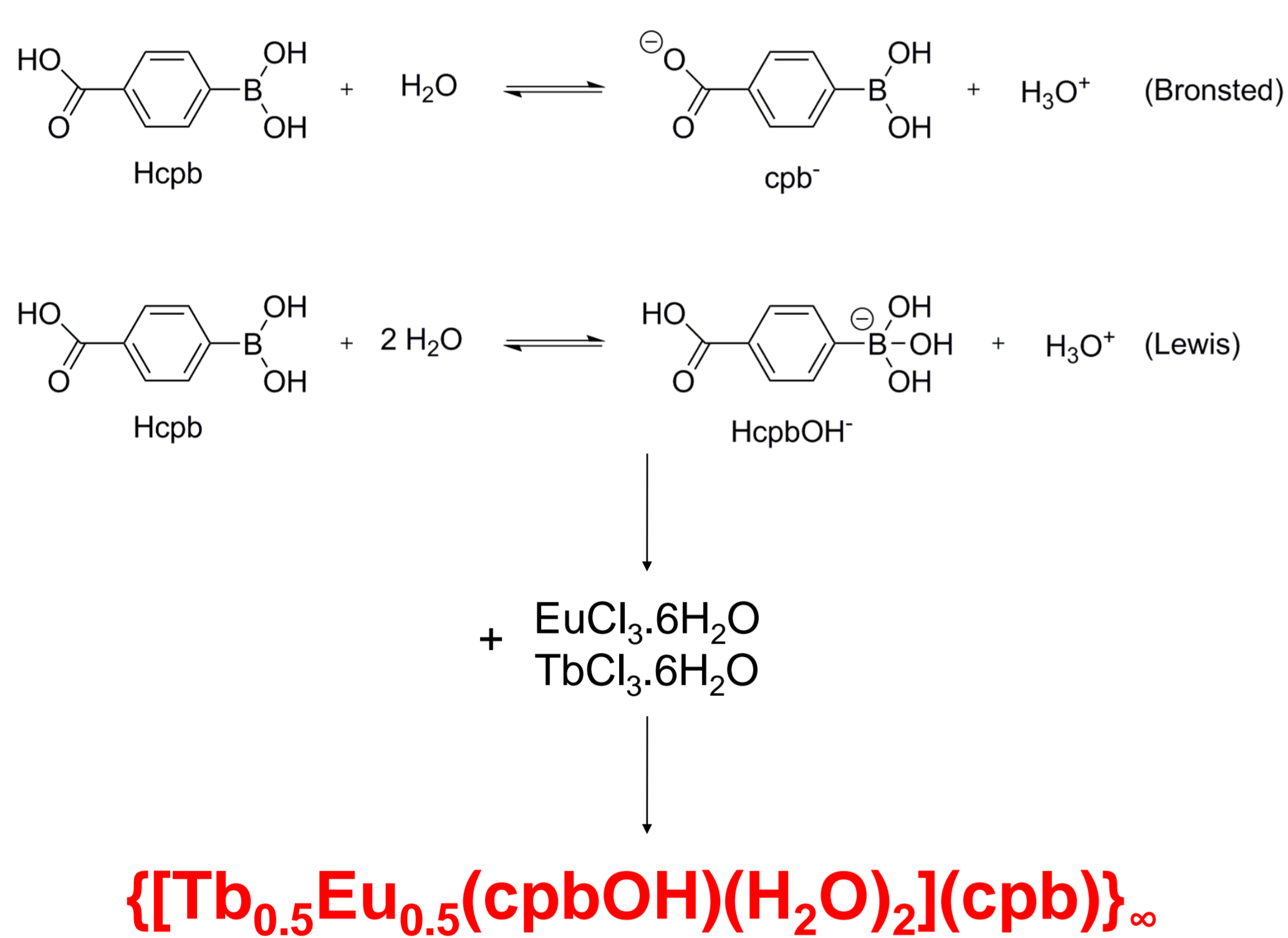
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Abstract

For more than a decade, coordination polymers have attracted attention because of their fascinating properties. Most often of these polymers were synthesized with benzene-polycarboxylate, imidazolate, phosphonate as ligands. Recently, a family of coordination polymers based on boronic acid, with the general chemical formula $\{[Ln(cpbOH)(H_2O)_2](cpb)\}_\infty$, has been published.¹ The synthesis of hetero-di-nuclear polymers (terbium/europium) based on this ligand leads to iso-structural materials. It has also been demonstrated that these materials have a luminescence which is highly temperature dependent. The shaping of these materials in the form of colloidal suspensions could allow the use of these compounds as molecular thermometers over a wide temperature range. The objective of our work is the characterization of the photo-physical properties of these materials in the solid state and as colloidal suspension.

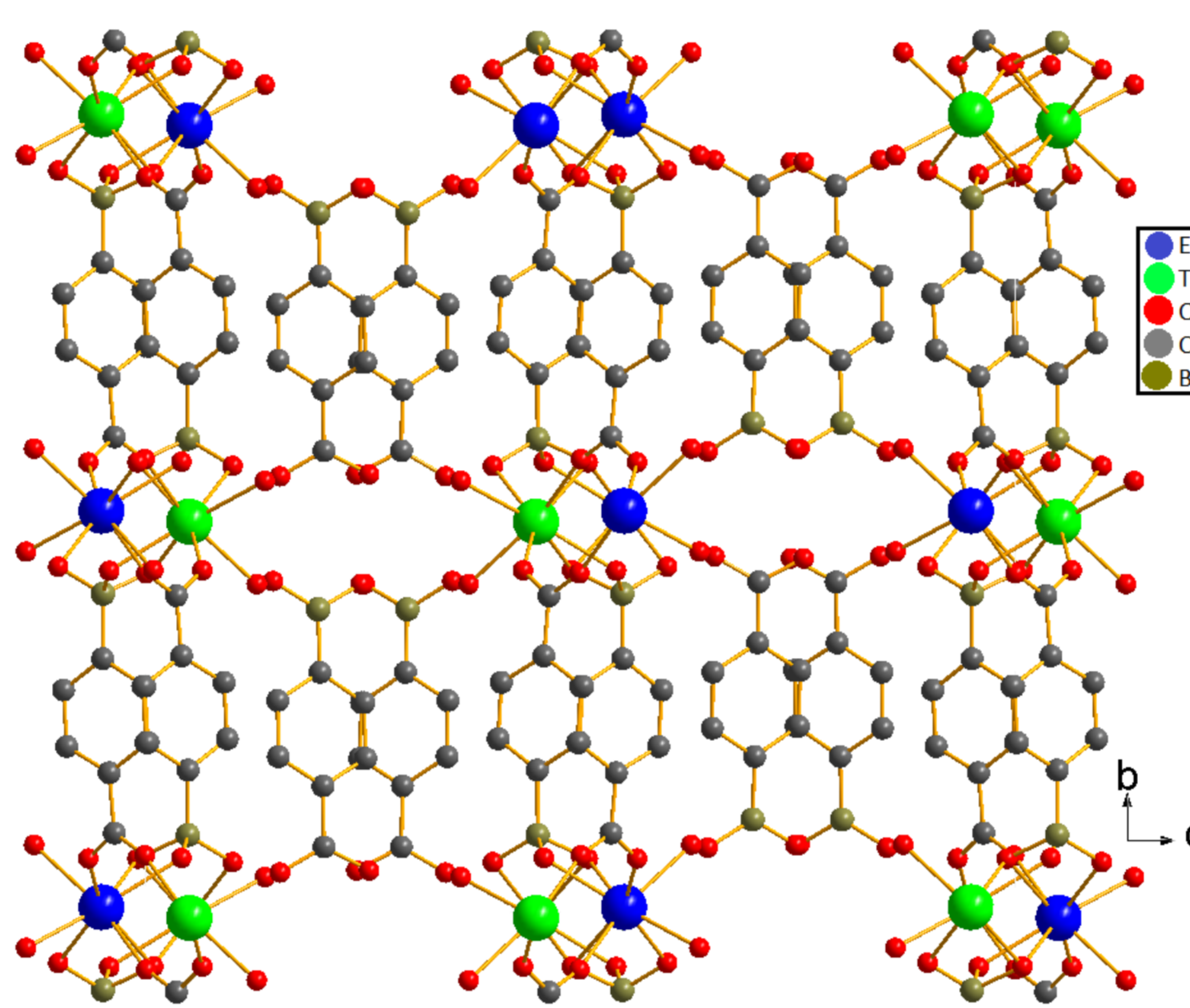
[1] X. Fan, S. Freslon, C. Daugebonne, L. Le Pollès, G. Calvez, K. Bernot, O. Guillou. *Inorganic Chemistry*, **54**, 5534-5546 (2015)

Synthesis

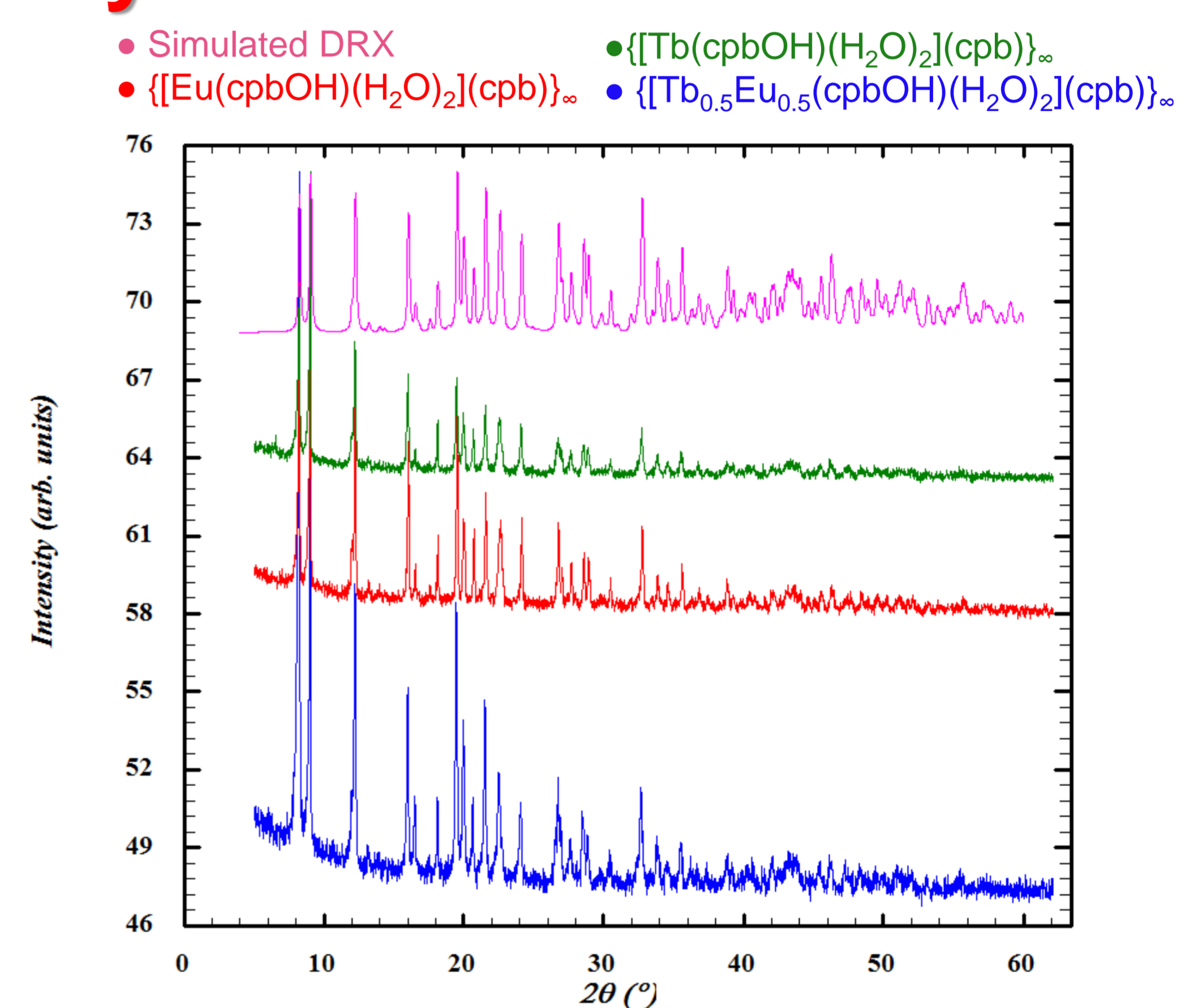


→ Picture :
Luminescence
under UV radiation
(312 nm)

DRX and structural analysis



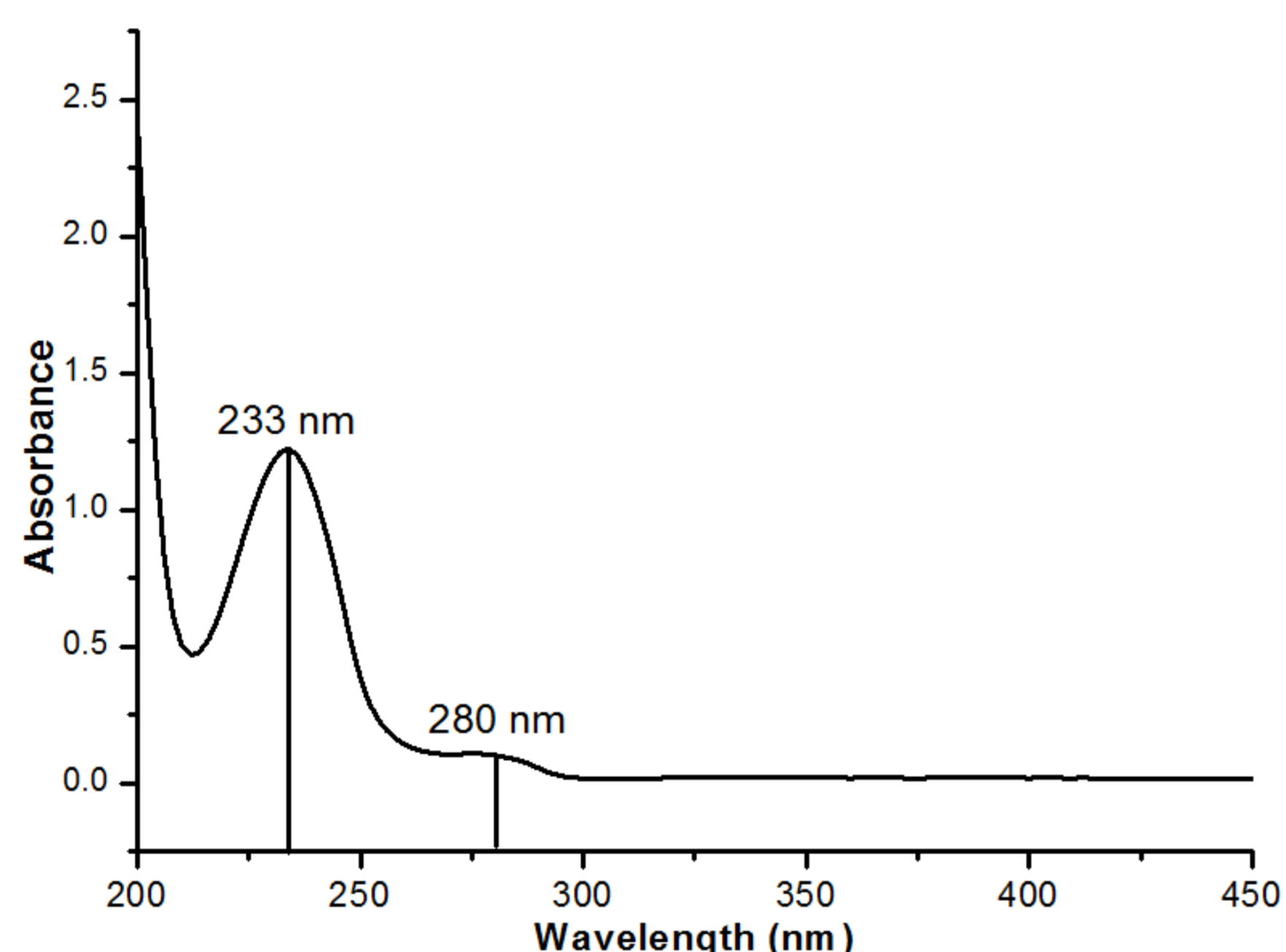
The polymer is
organized as
2D layers



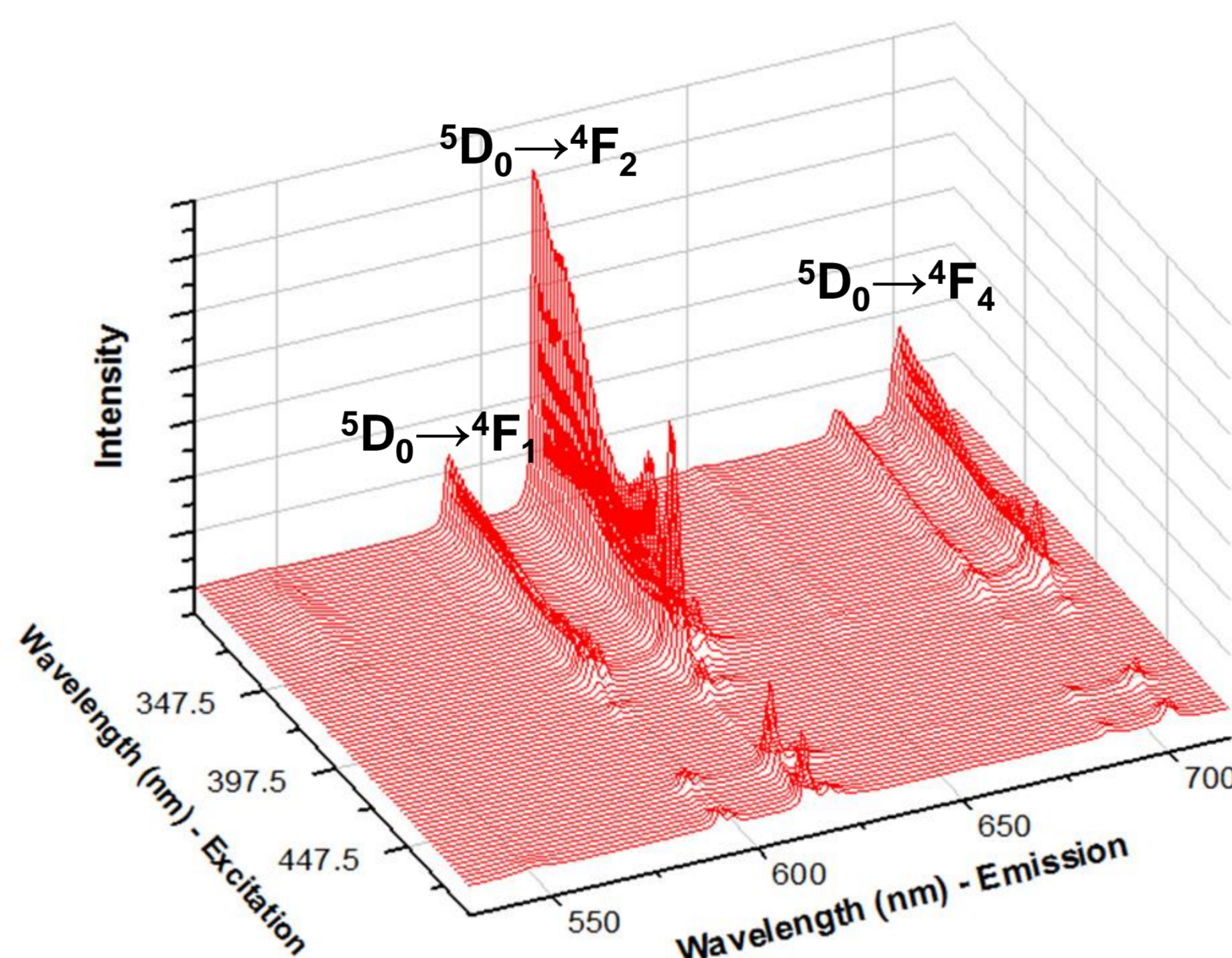
Molecular formula	TbO ₁₁ C ₁₄ H ₁₇ B ₂
System / space group	Orthorhombic / pbca
Lattice parameters (Å)	a = 8.5704(1), b = 19.5411(1), c = 21.4191(7)
Cell volume	3587.71 Å ³

Optical properties

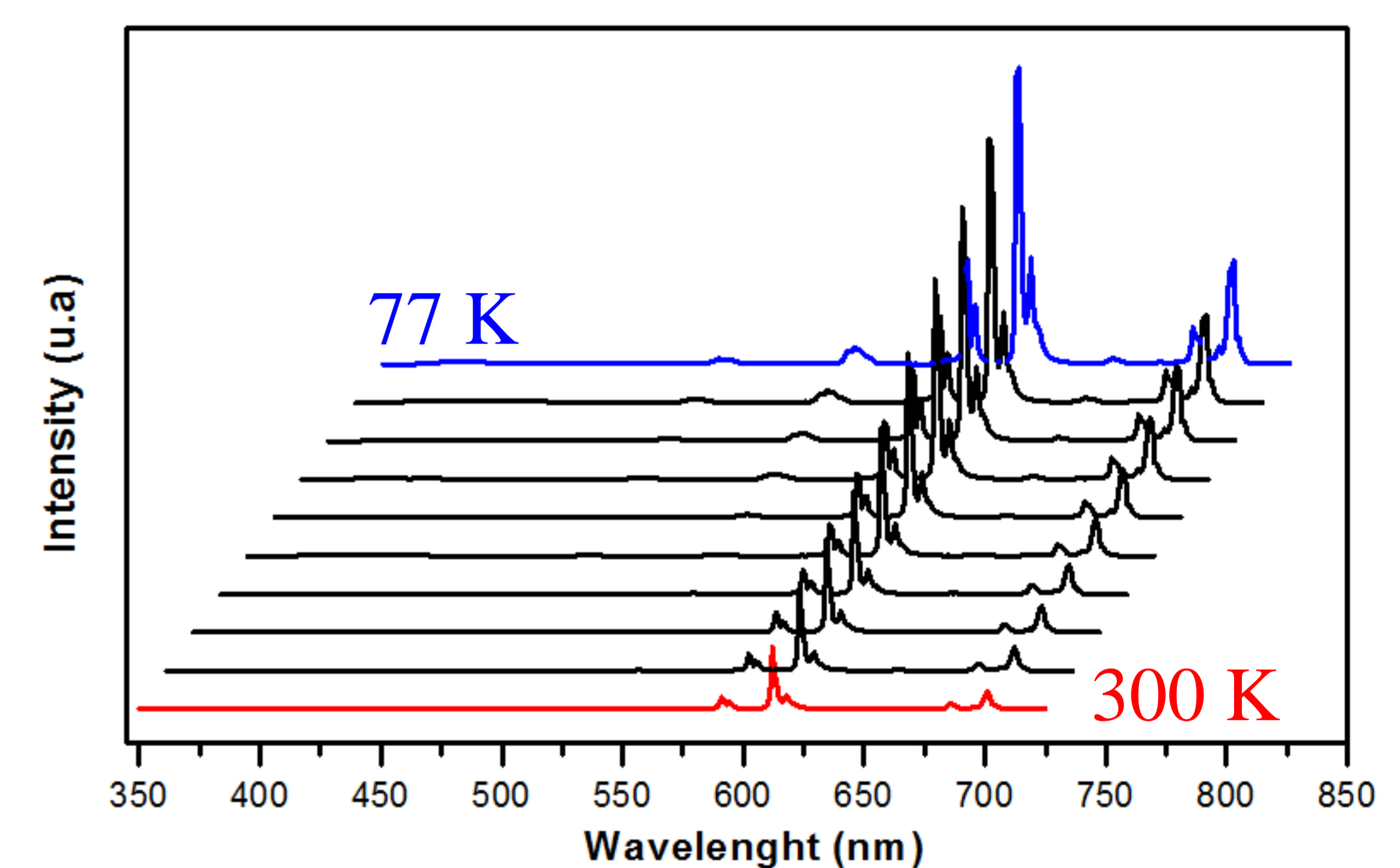
Absorption of a ligand salt solution in
UV region



The peaks of europium are
dominant due to transfer energy



The luminescence decreases as
increases the temperature



Emission spectra of an hetero-nuclear compound (Tb/Eu) versus wavelength excitation (left) and versus temperature (right)

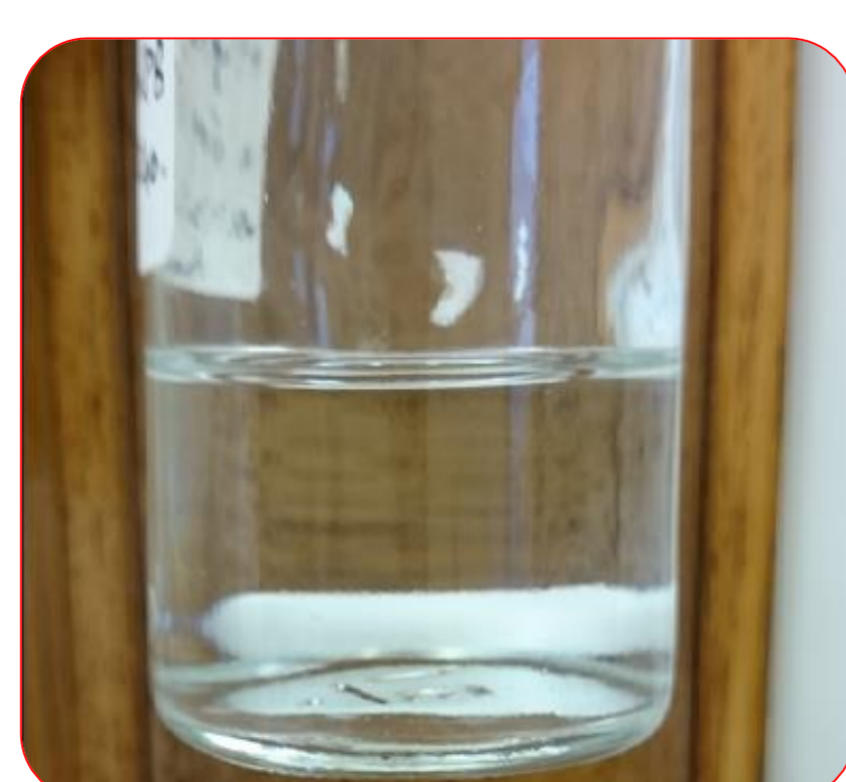
Post-synthetic nano-metrization

Stirring of the solid in ethylene glycol :



Cloudy solution

5 days



Limpid solution

Perspectives

Some of these results are promising, especially post-synthetic nano-metrization. So, several tests will be done to complete the study. Also, other systems with boronic acid will be studied and characterized for new optical properties, that can be of interest for industries.