

# A STUDY ON SPECTROSCOPIC QUALITIES AND MICROSTRUCTURE OF OXYFLUORIDE GLASSES AND GLASS-CERAMICS DOPED WITH SELECTED LANTHANIDE IONS

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- 2. Preparation of the materials**
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- 4. Structural and Morphological characterization**
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- 6. Up-conversion phenomena**
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## Preparation of the Oxyfluoride Glasses

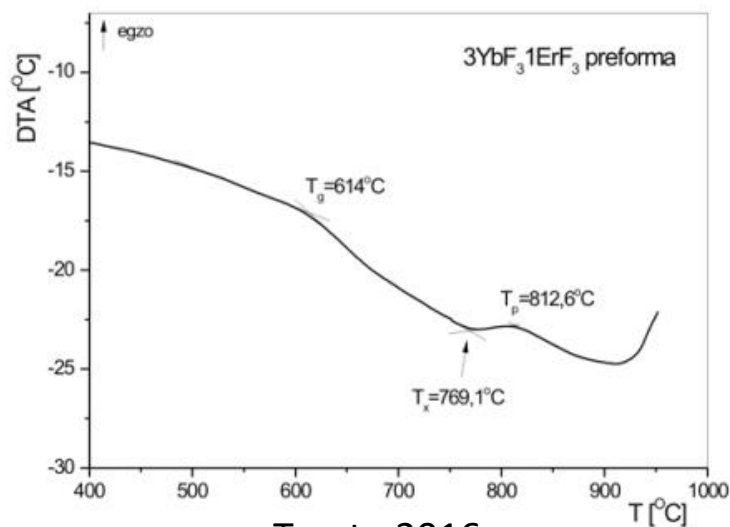
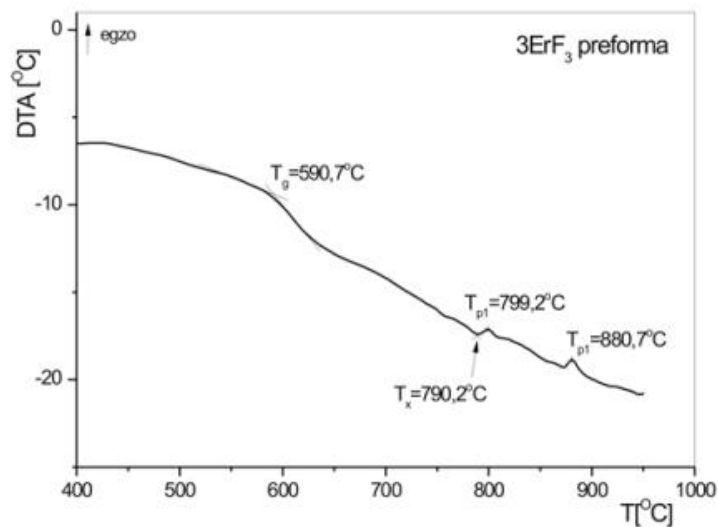
48%SiO<sub>2</sub>-11%Al<sub>2</sub>O<sub>3</sub>-7%Na<sub>2</sub>O-10%CaO-10%PbO-(11-x-y)%PbF<sub>2</sub>-  
x%ErF<sub>3</sub>,y%YbF<sub>3</sub>

40%SiO<sub>2</sub>-25%Al<sub>2</sub>O<sub>3</sub>-18%Na<sub>2</sub>CO<sub>3</sub>-7%NaF-(10-x-y)%YF<sub>3</sub>-x%HoF<sub>3</sub>,y%YbF<sub>3</sub>

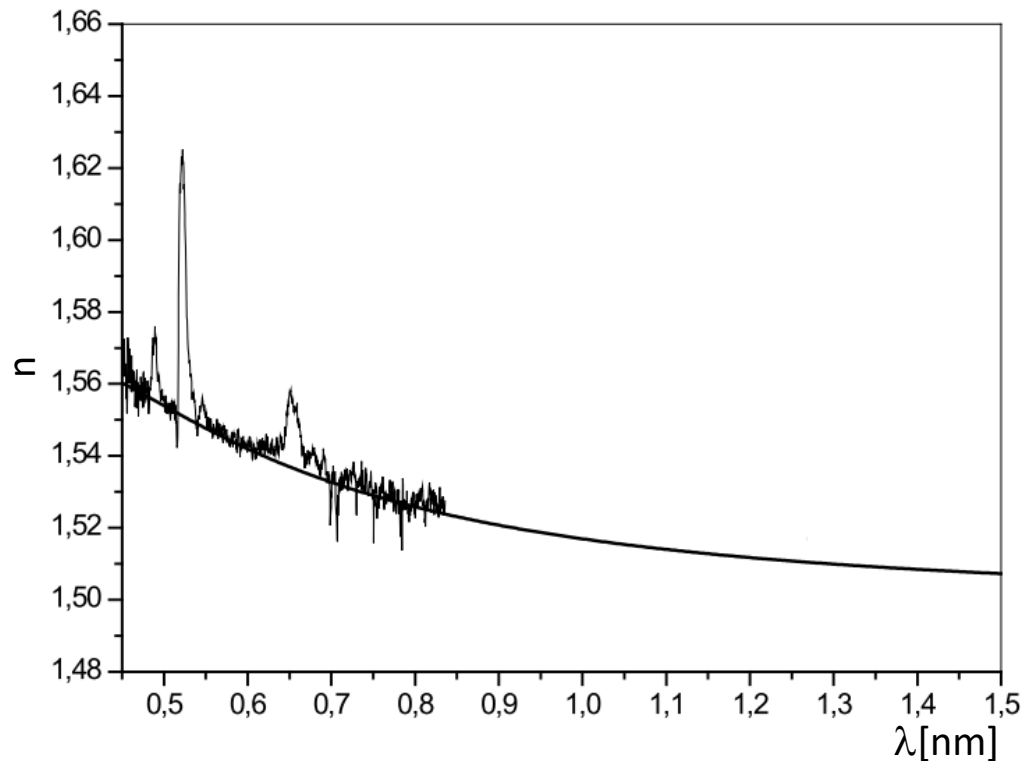
40%SiO<sub>2</sub>-25%Al<sub>2</sub>O<sub>3</sub>-18%Na<sub>2</sub>CO<sub>3</sub>-7%NaF-(10-x)%YF<sub>3</sub>-x%PrF<sub>3</sub>



# Thermal properties of the base glasses



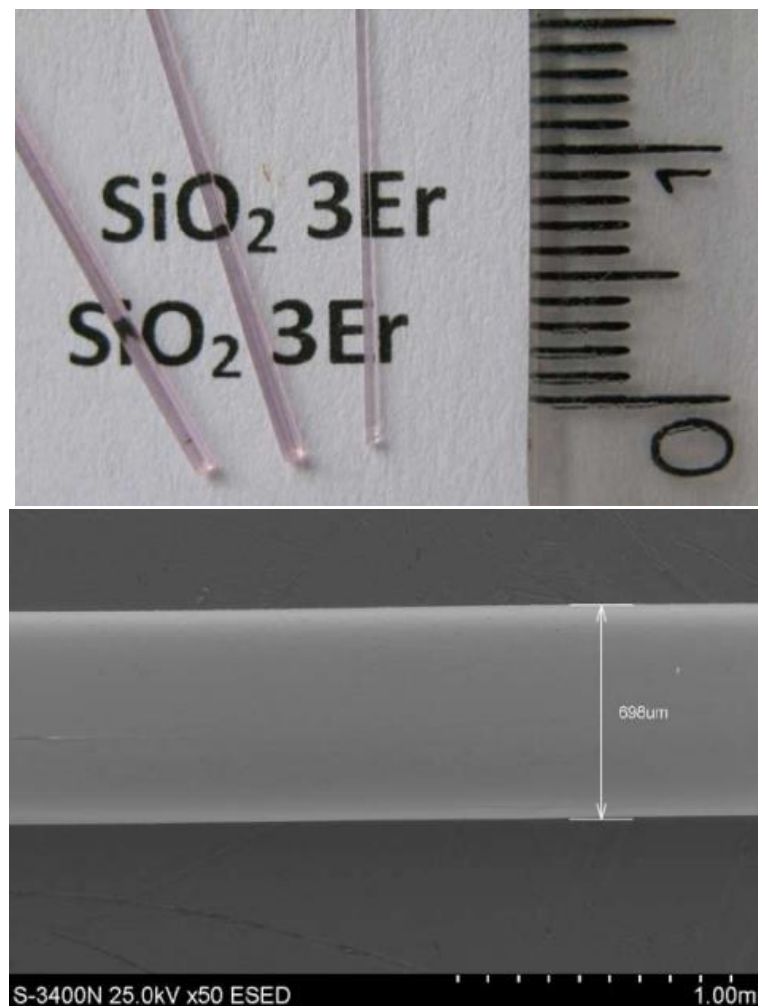
# Refractive index and density of the glass



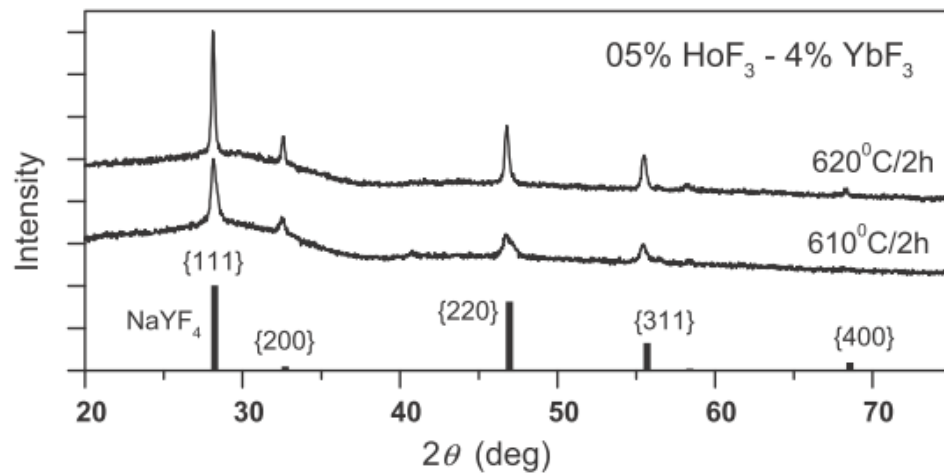
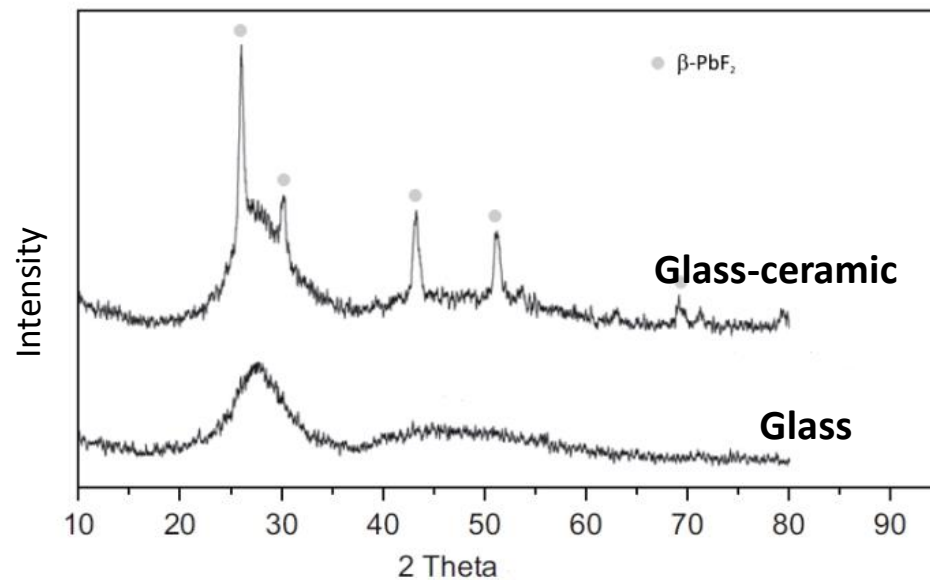
Preform	$\rho$ [g/cm <sup>3</sup> ]
<b>3ErF<sub>3</sub></b>	3,77
<b>3YbF<sub>3</sub>1ErF<sub>3</sub></b>	3,80

$\lambda$ [μm]	n
0,486	1,555
0,589	1,543
0,656	1,536
0,852	1,523
1,000	1,516
1,200	1,511
1,350	1,509
1,500	1,507

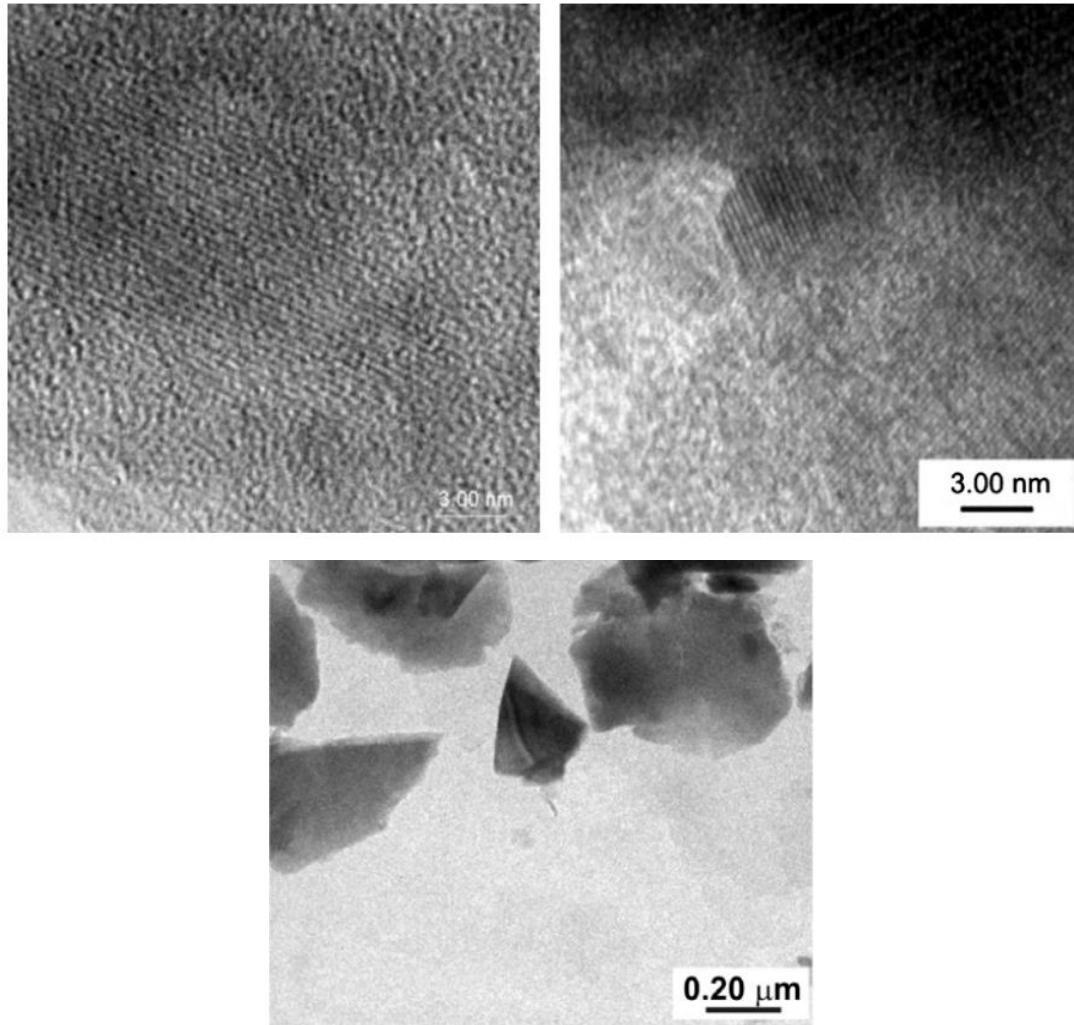
## Fabrication of the fibers



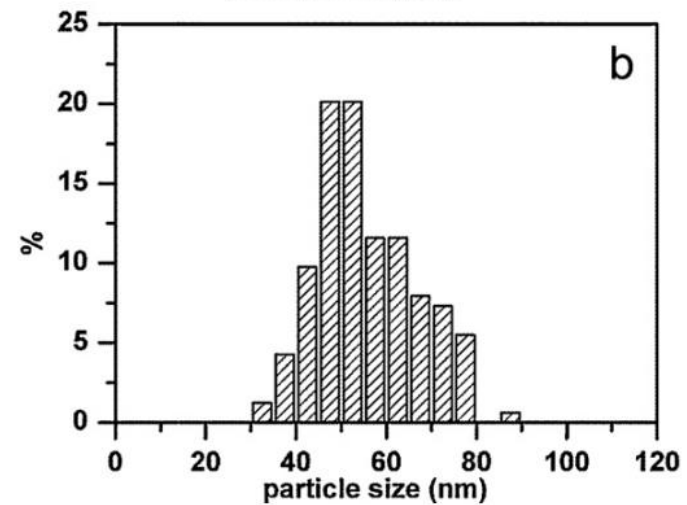
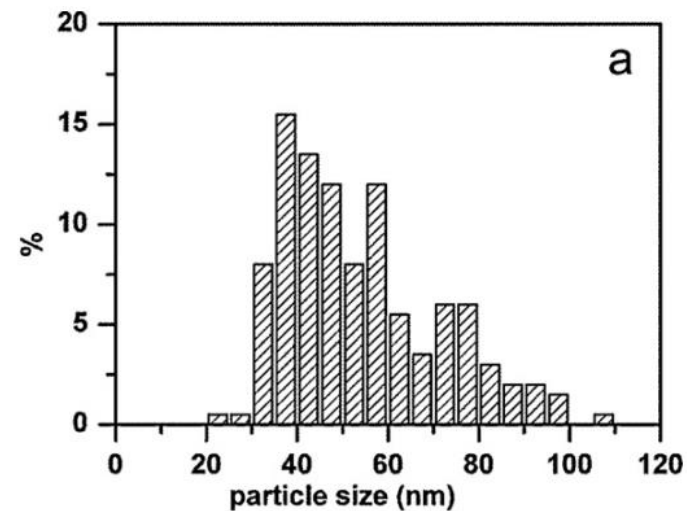
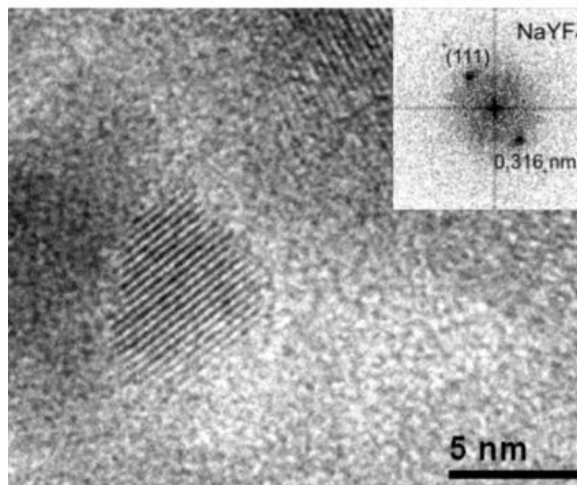
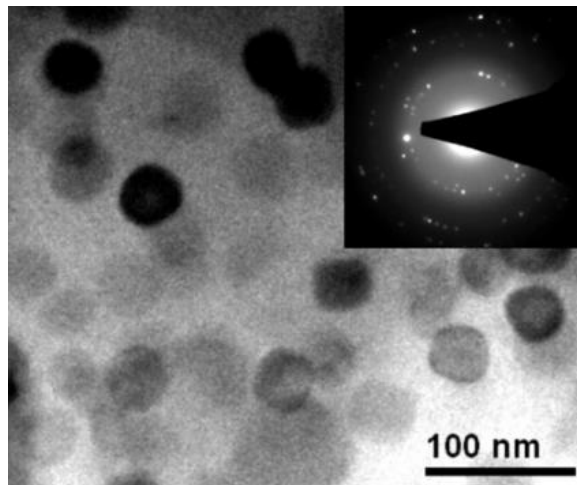
## XRD analysis



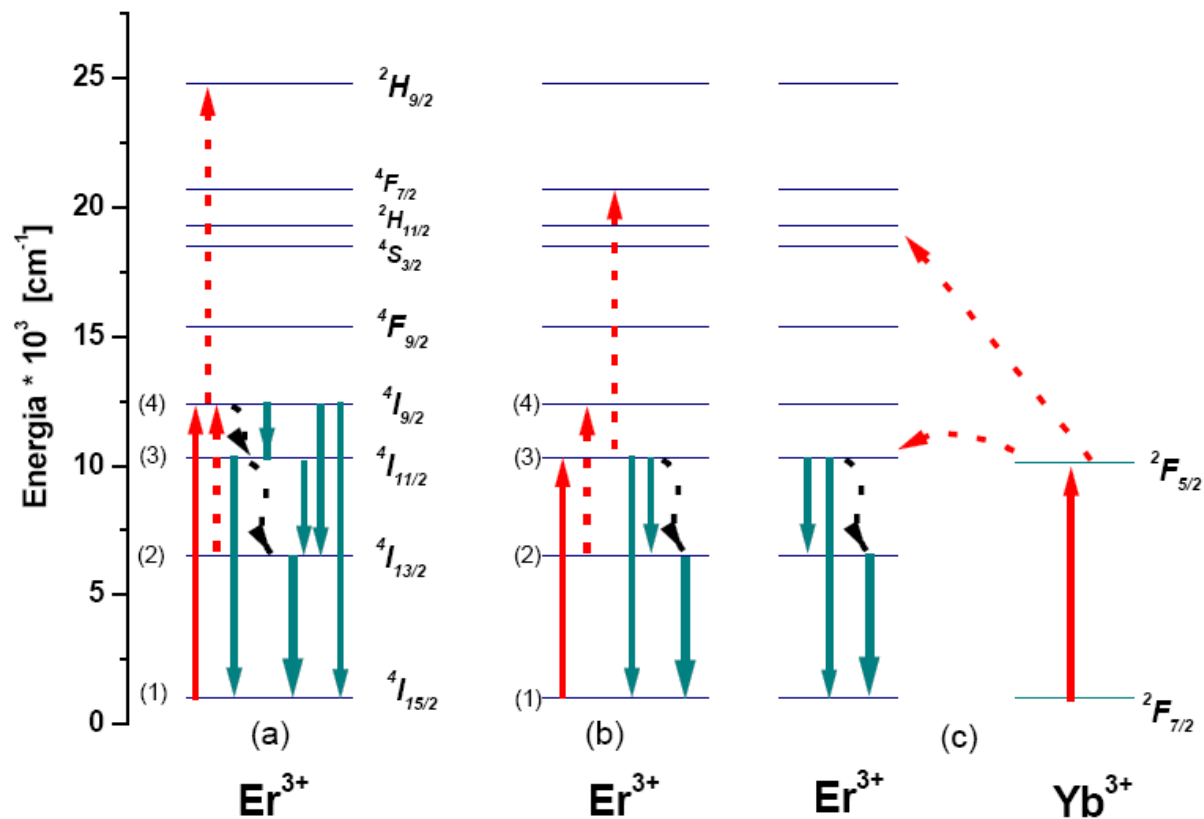
# Morphological characterization



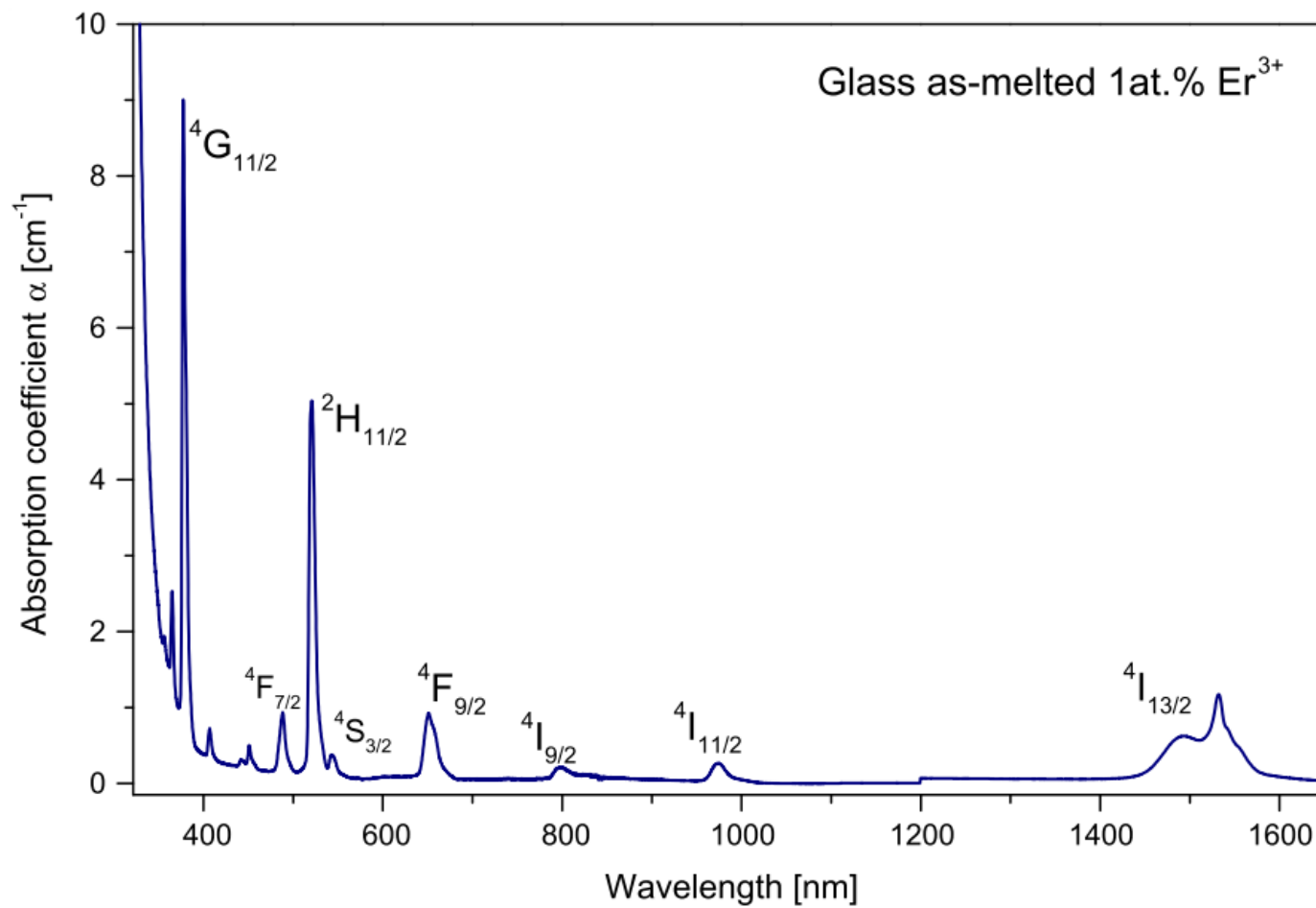
# Morphological characterization



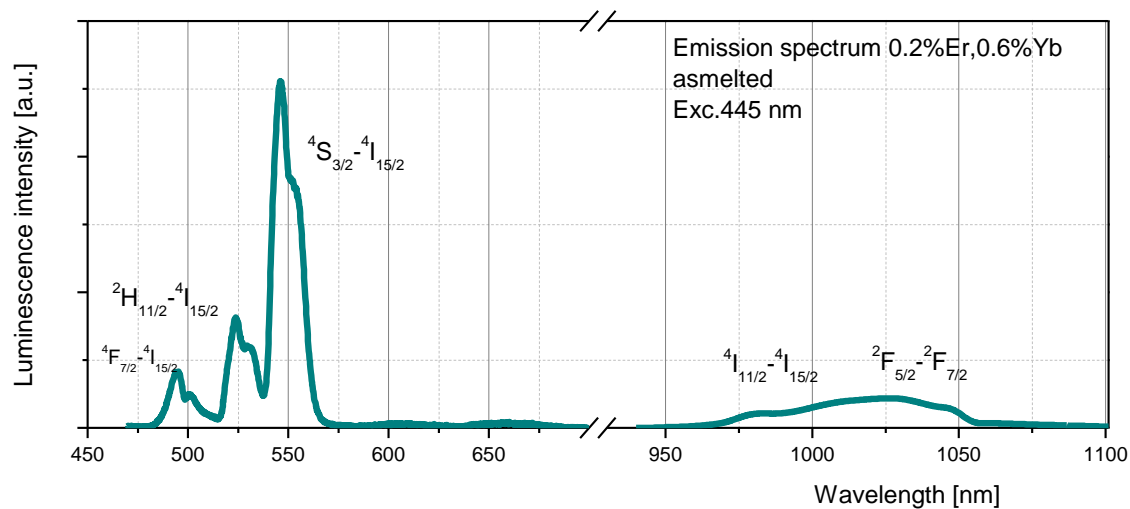
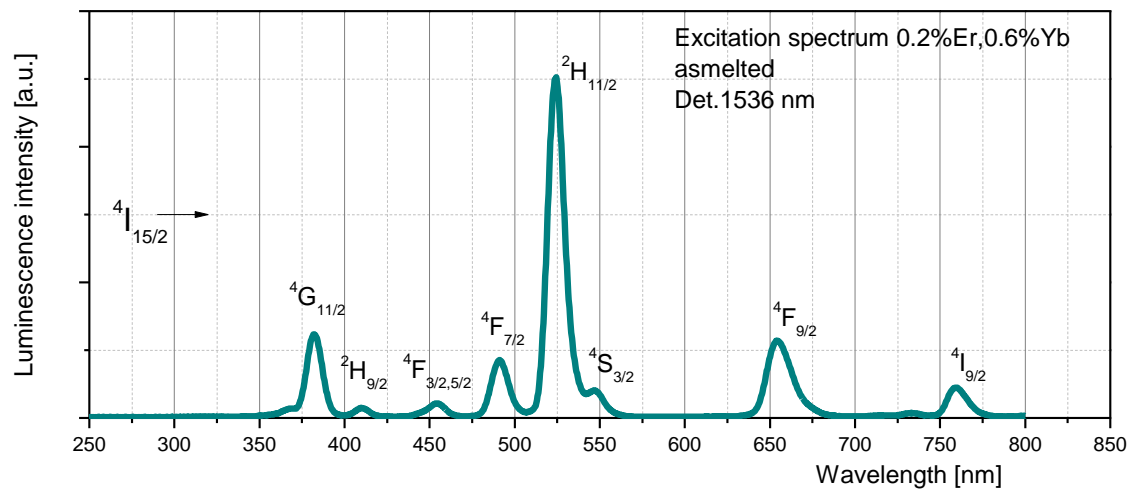
# Er-doped glass and glass-ceramics



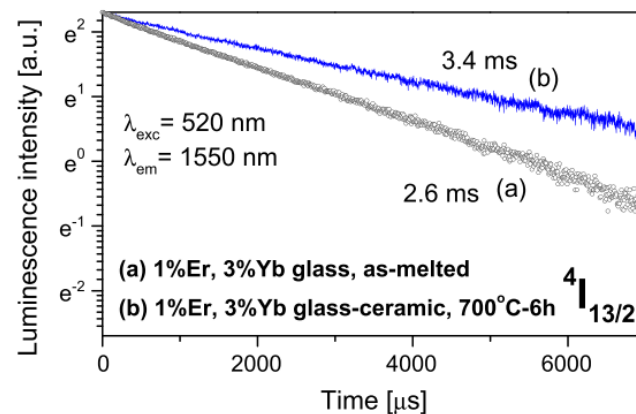
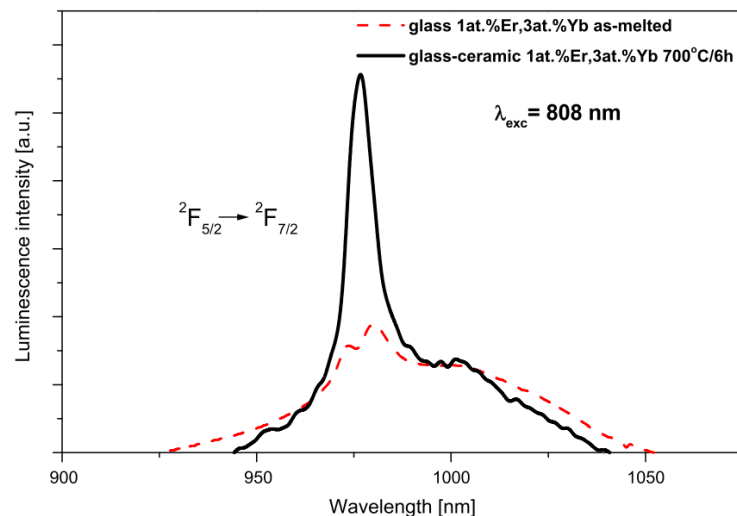
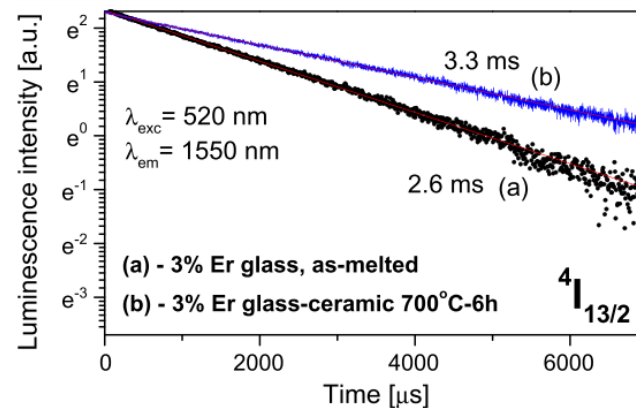
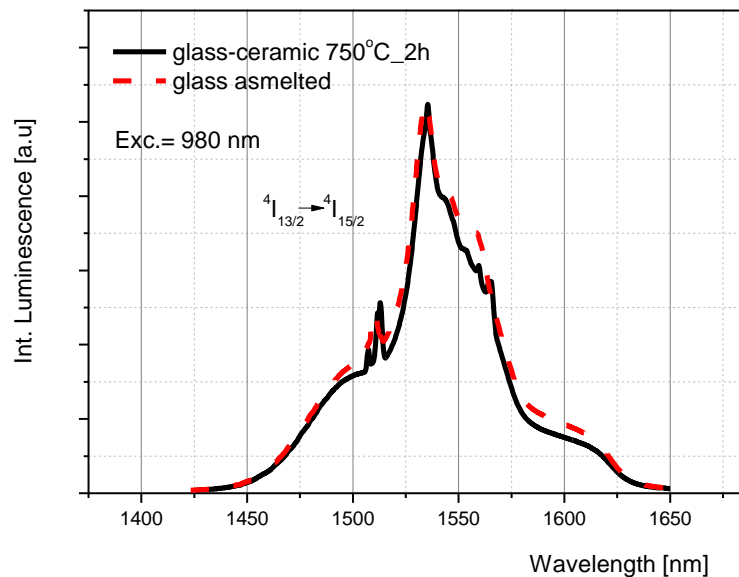
# Absorption spectrum



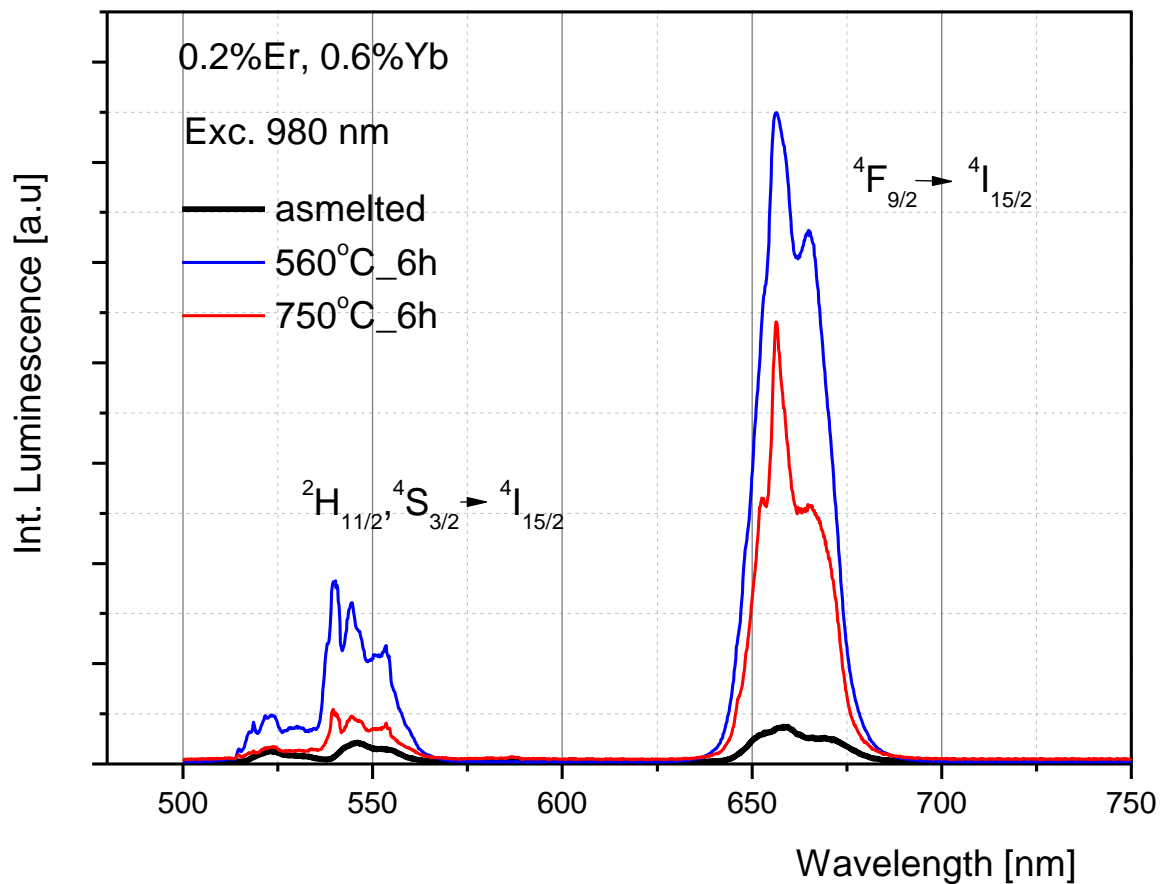
# Emission properties



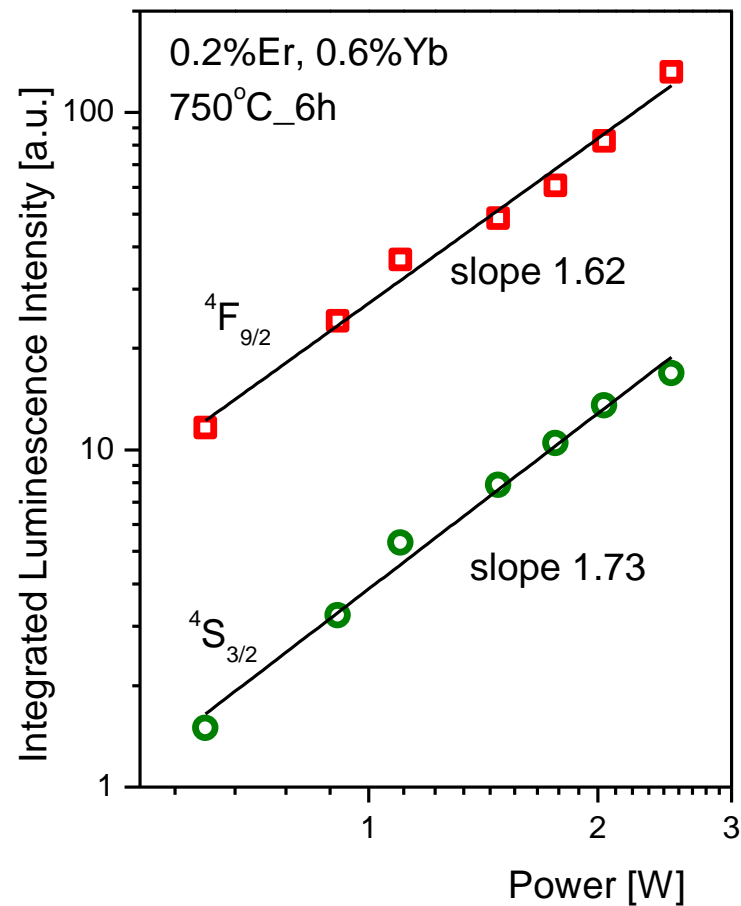
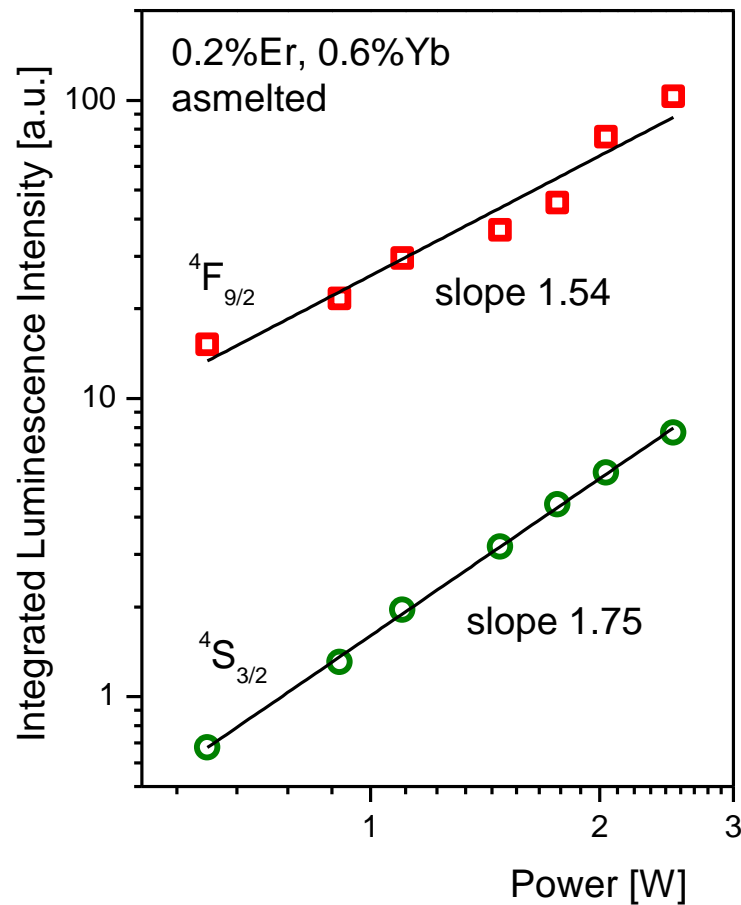
# Emission properties



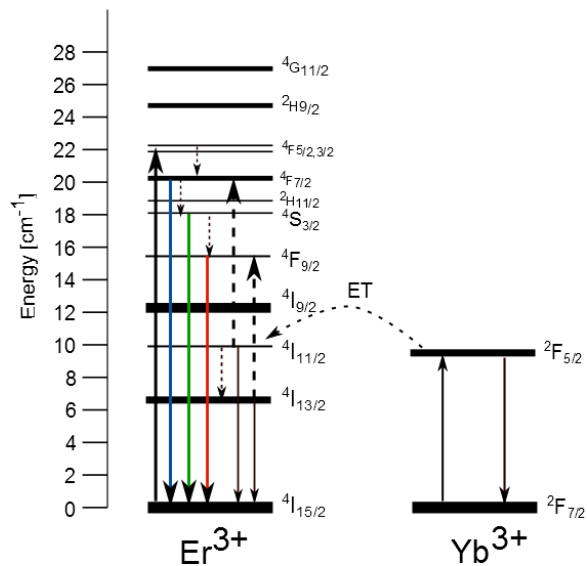
# Upconversion phenomena



# Upconversion phenomena



# Relaxation of excited states



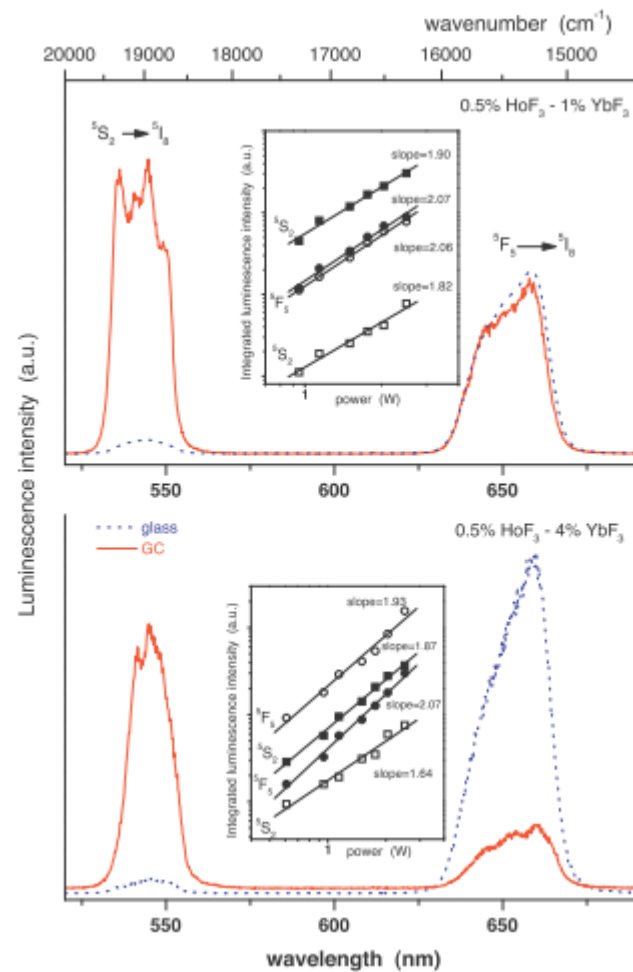
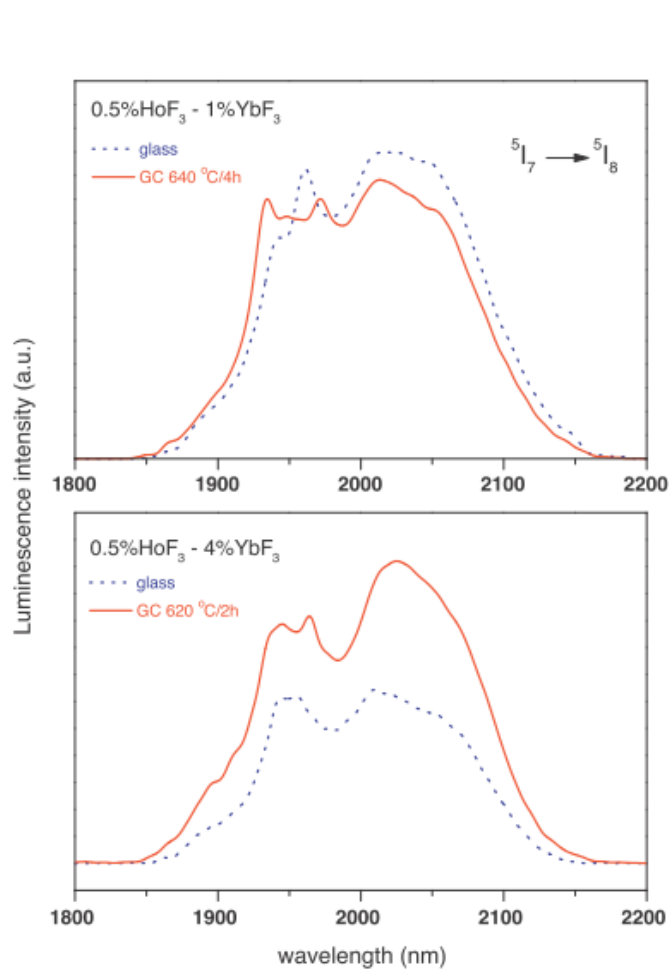
**0.2%Er, 0.6%Yb as melted**

**0.2%Er, 0.6%Yb 600°C\_6h**

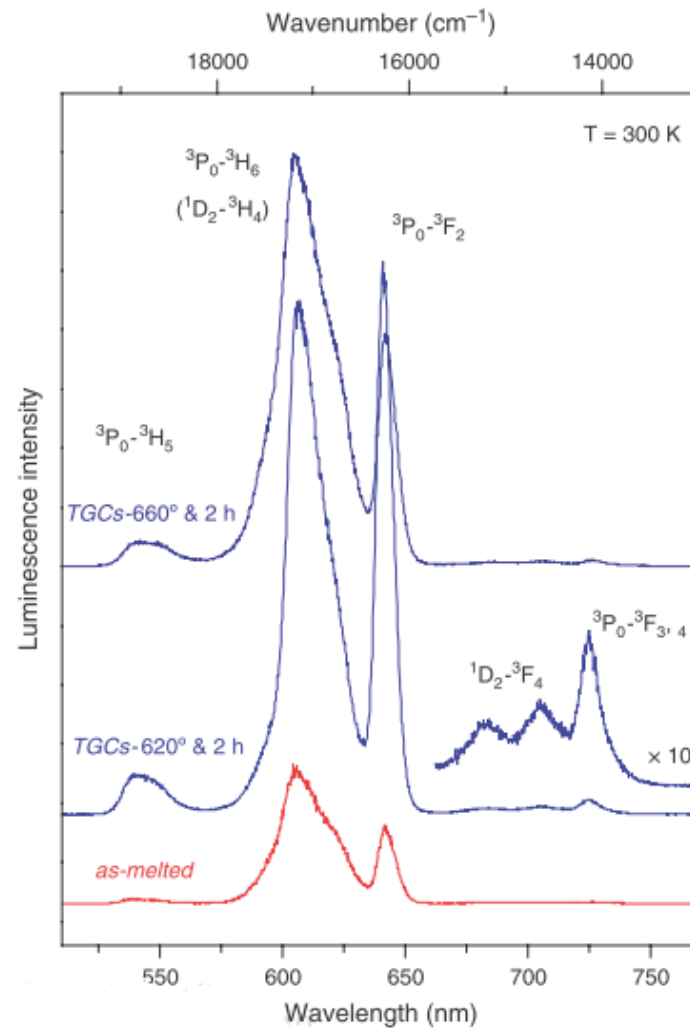
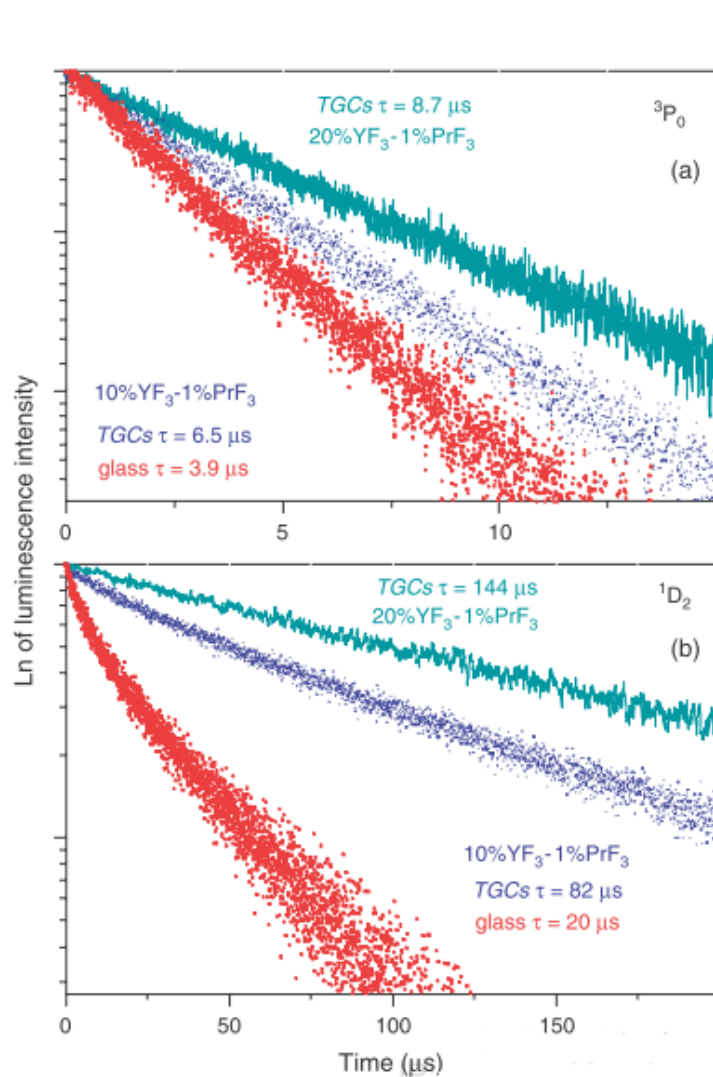
**0.2%Er, 0.6%Yb 750°C\_6h**

$^4S_{3/2}(\text{Er})$ [μs]	$^4I_{11/2}(\text{Er}),$ [μs]	$^2F_{5/2}(\text{Yb}),$ [μs]	$^4I_{13/2}(\text{Er})$ [μs]
11 (ne)	171 (ne)	508	2502
12 (ne)	126 (ne)	492	3316
11 (ne)	56 (ne)	475	3414

# Ho-doped glass and glass-ceramics



# Pr-doped glass and glass-ceramics



## Conclusions

- Oxyfluoride glasses, glass-ceramics and fibers were successfully obtained
- Controlled process of crystalline fluoride phases creation was elaborated
- Optical study implied that luminescent ions are accommodated into well-defined sites within the ordered components
- It has been deduced that the green up-converted emission in as-melted glass turns to red emission in glass-ceramics



**Thank you for your attention !**