

Study of Tb3+-Yb3+ doped Silicon Nitride frequency conversion layers for Solar Cell Applications

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COS



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Motivations

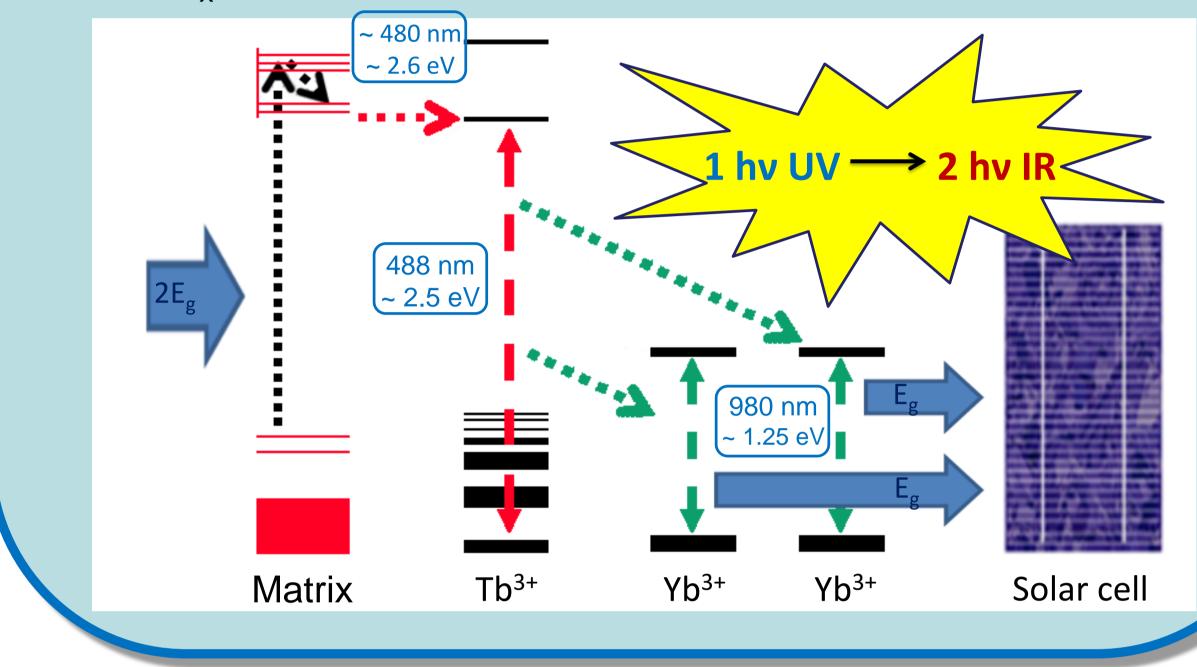
- Improving solar cells efficiency by adding a Down-Conversion layer on top of it
 - → Tb³⁺-Yb³⁺ doped Silicon Nitride

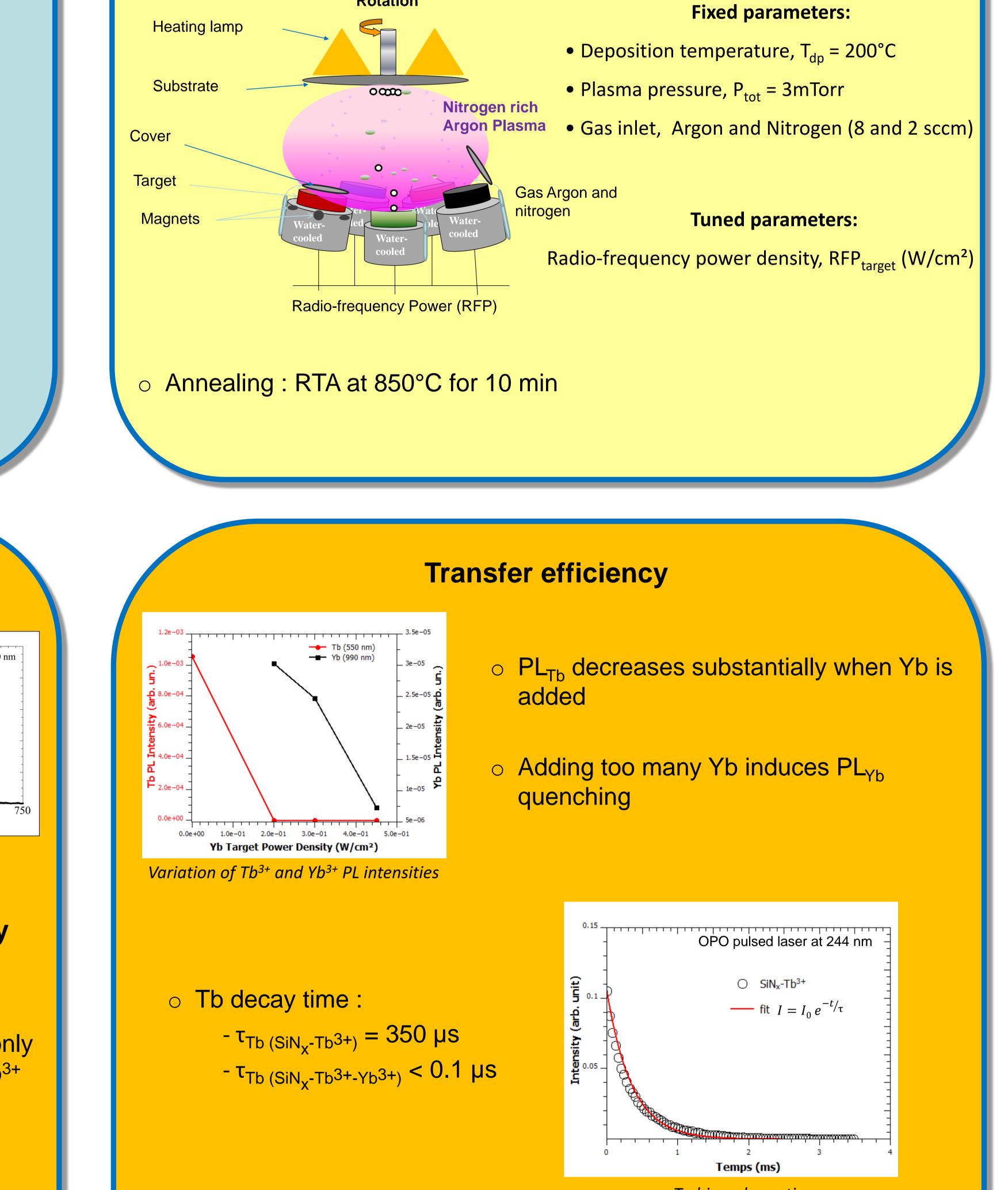


Confocal reactive magnetron co-sputtering

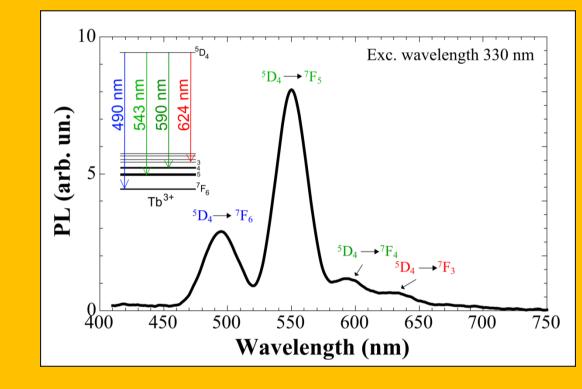
Rotation

- System compatible with the Si solar cell fabrication
 - \rightarrow SiN_x as matrix





Significant Tb emission at a non



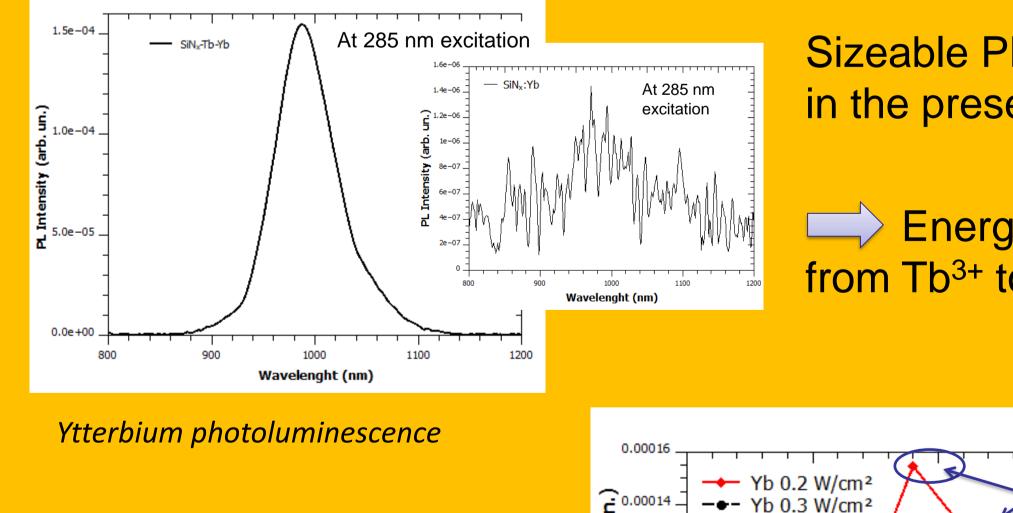


Energy transfer from the matrix to Tb³⁺

Terbium photoluminescence

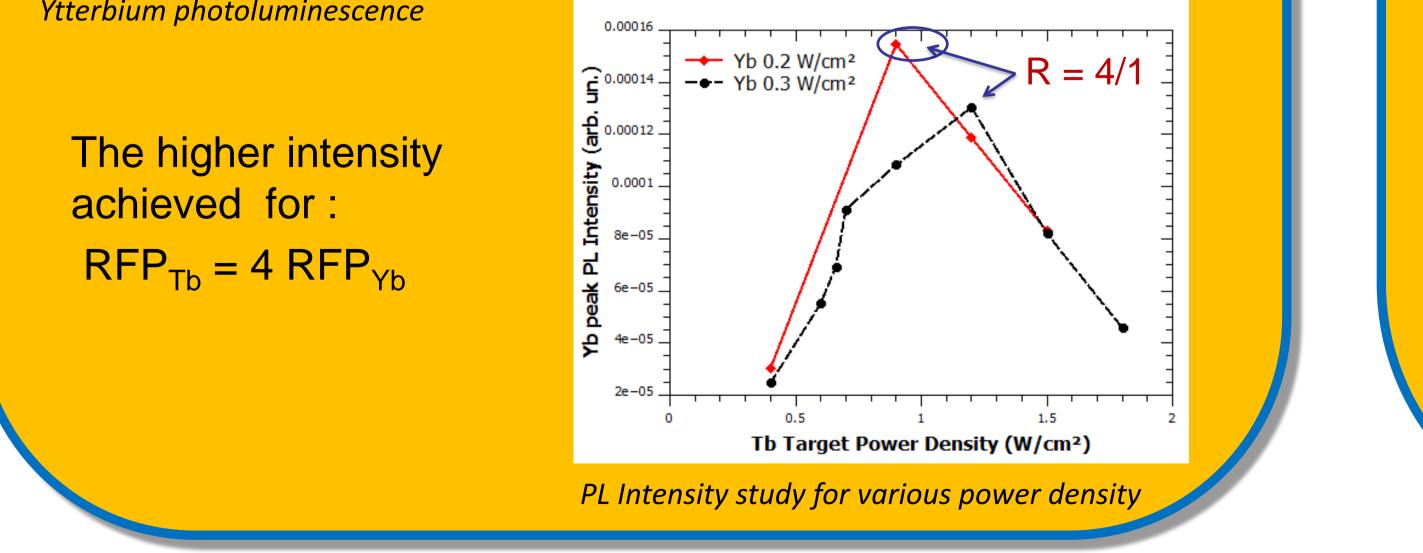
Yb³⁺ addition :Optimisation of the layer chemistry in order to obtain the maximum PL intensity

SiN_x-Tb³⁺ system



Sizeable PL_{yb} peak only in the presence of Tb³⁺

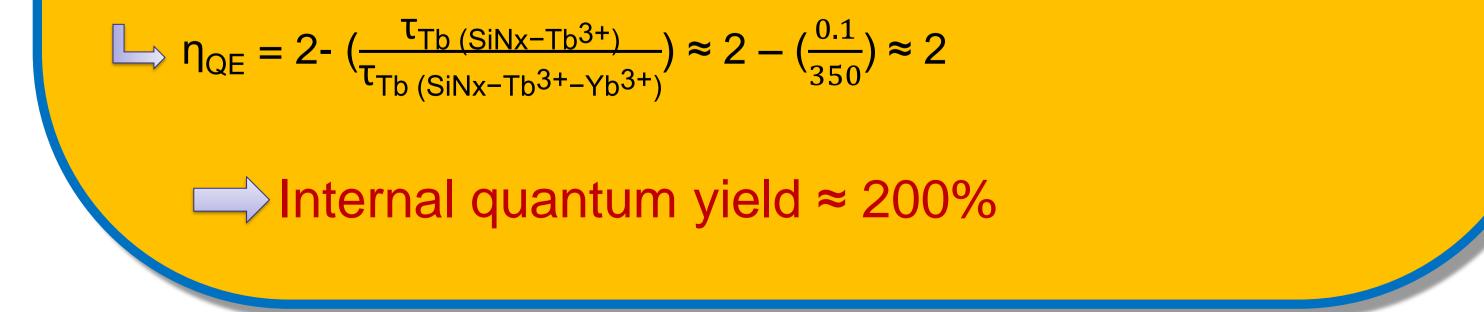
Energy transfer from Tb^{3+} to Yb^{3+} ?



Terbium decay time

 \rightarrow Since there is a Yb emission, the extinction of PL_{Tb} is not due to defect quenching

Total transfer from Tb to Yb (confirmed by PL and PLE spectra)



Conclusion

- > Evidence of the efficiency of the energy transfer from the matrix to Tb and from Tb to Yb
- Maximum internal quantum yield of 200%
- Process totally compatible with the industrial solar cells.

