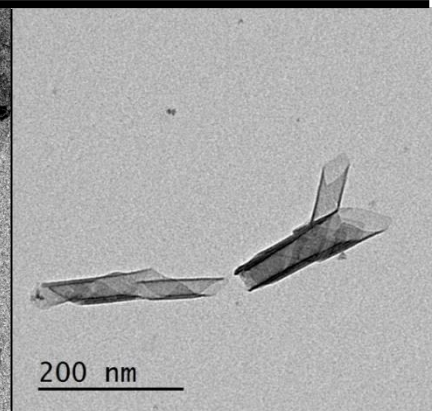
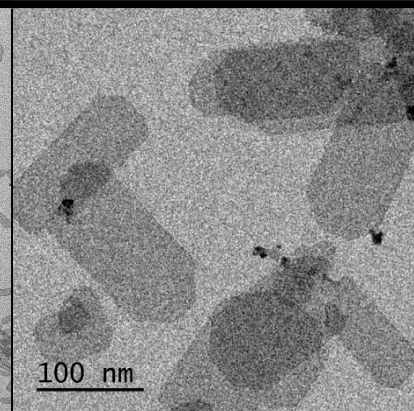
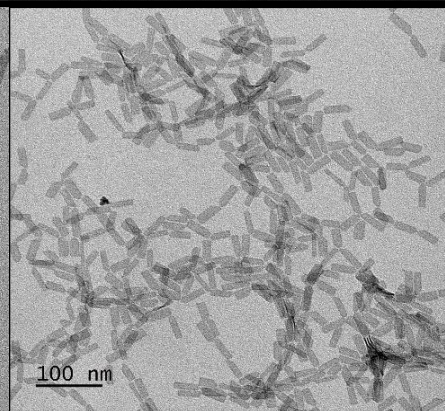
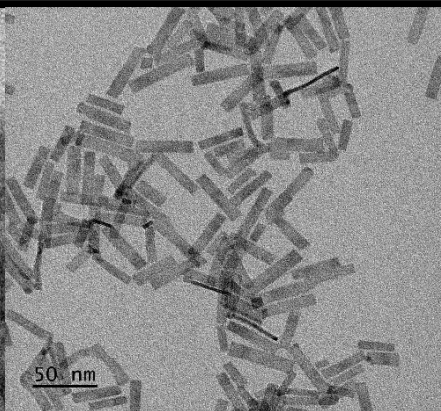
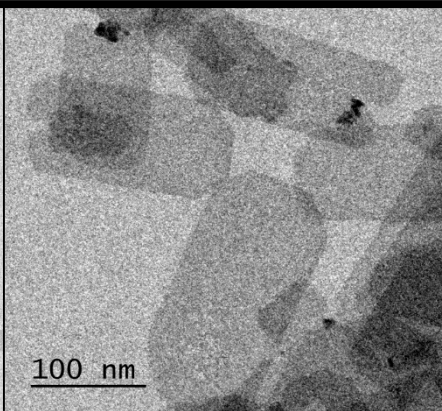
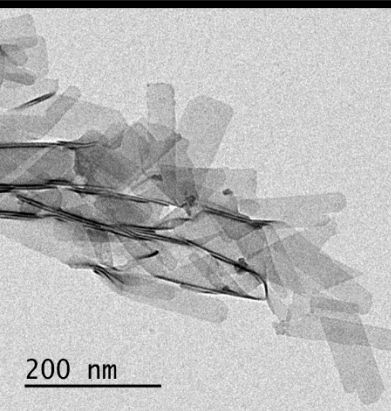


Synthesis of Cadmium based nanoplatelets and tuning of the optical properties through the thickness



Nicolas Moghaddam, Sandrine Ithurria

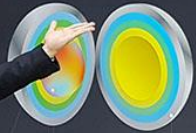


QLED Technology



New Alloy Quantum Dot

Next-generation display of nano-sized materials



Gradient ZnSeS shell

New Metal Implemented Core

New Metal Implemented Shell

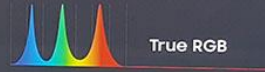
One Material, One Billion Colors

Nanoparticles change light into one billion colors



The Perfect Material for TV

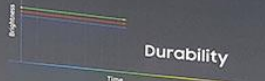
Reproduce everything that human eye can see



True RGB



Energy Efficiency



Durability

Techarp.com

Happy guy

→ Jimmy TAN, Samsung Head of consumer electronics Malaysia

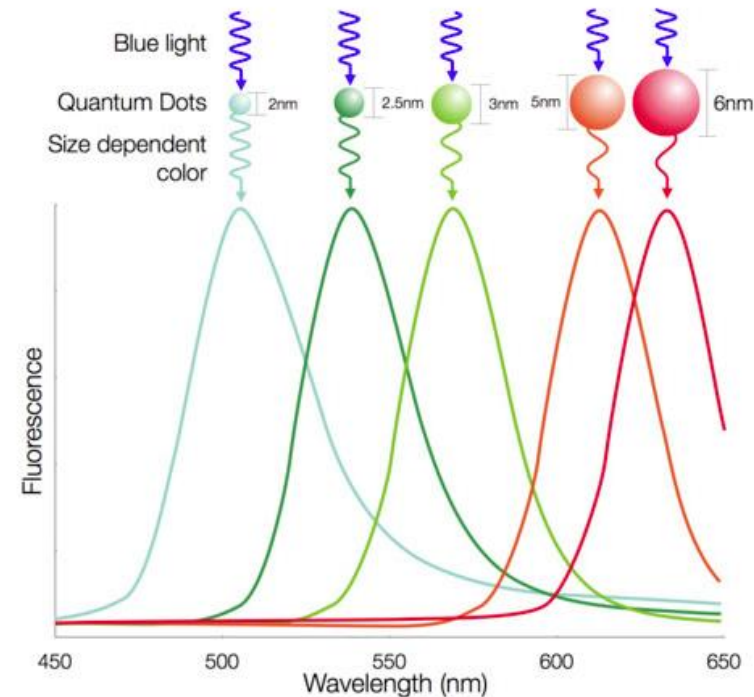
→ Presentation of QLED TV improved technology in 2017 (first in 2013)

Quantum Dots technology
→ 3D CdSe semiconductors NPs

Monochromatic emitters
→ pure color

Color is size depending
→ Quantum confinement

Quantum Dot Size and Color

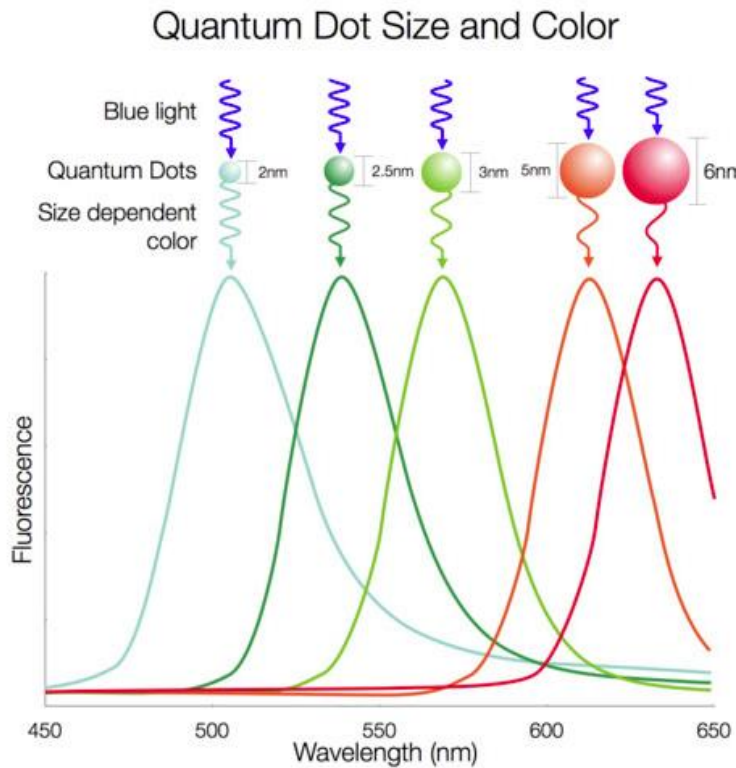


Displayspecification.com

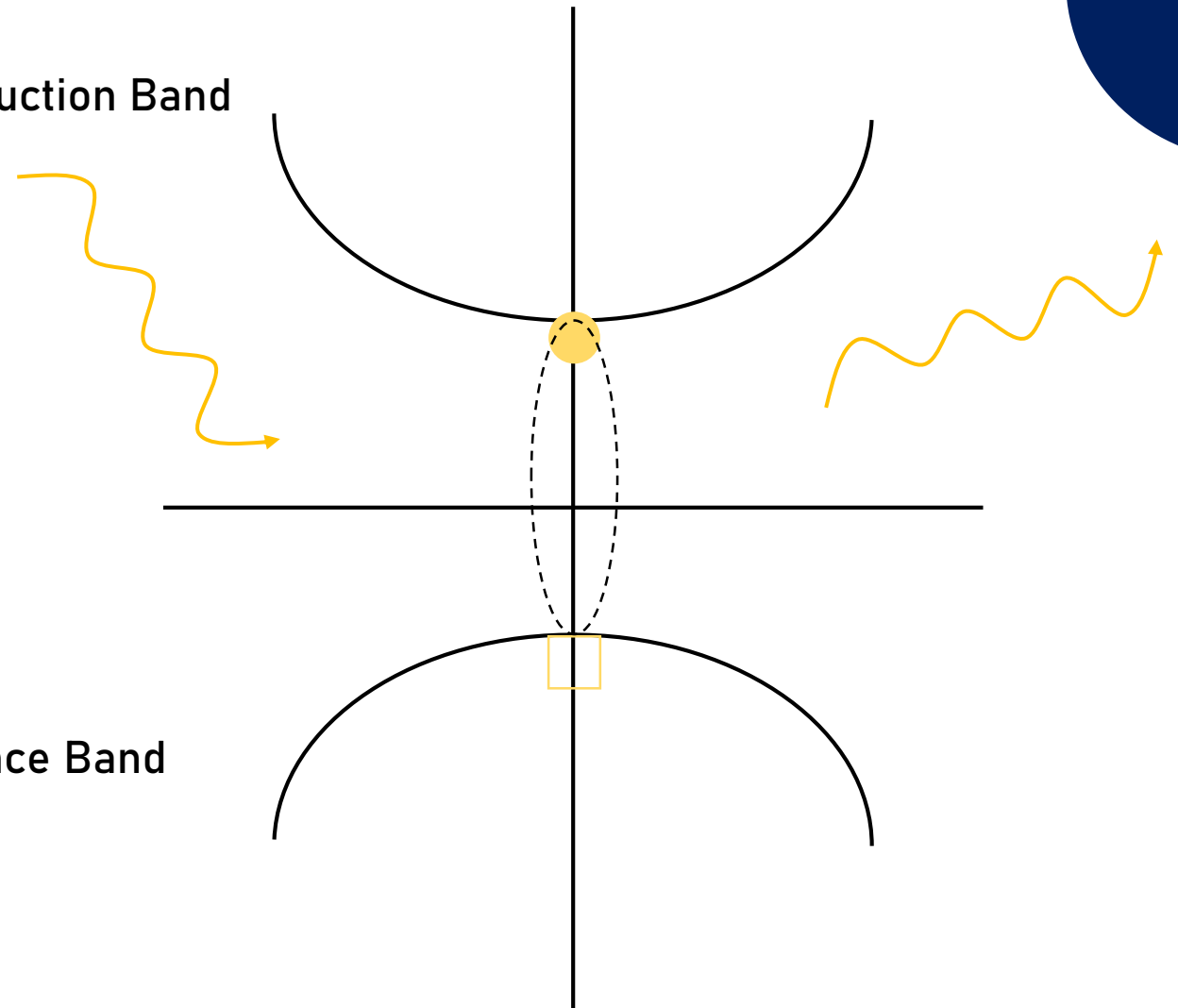
Quantum Dots technology
→ 3D CdSe semiconductors NPs

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→ Quantum confinement



Conduction Band



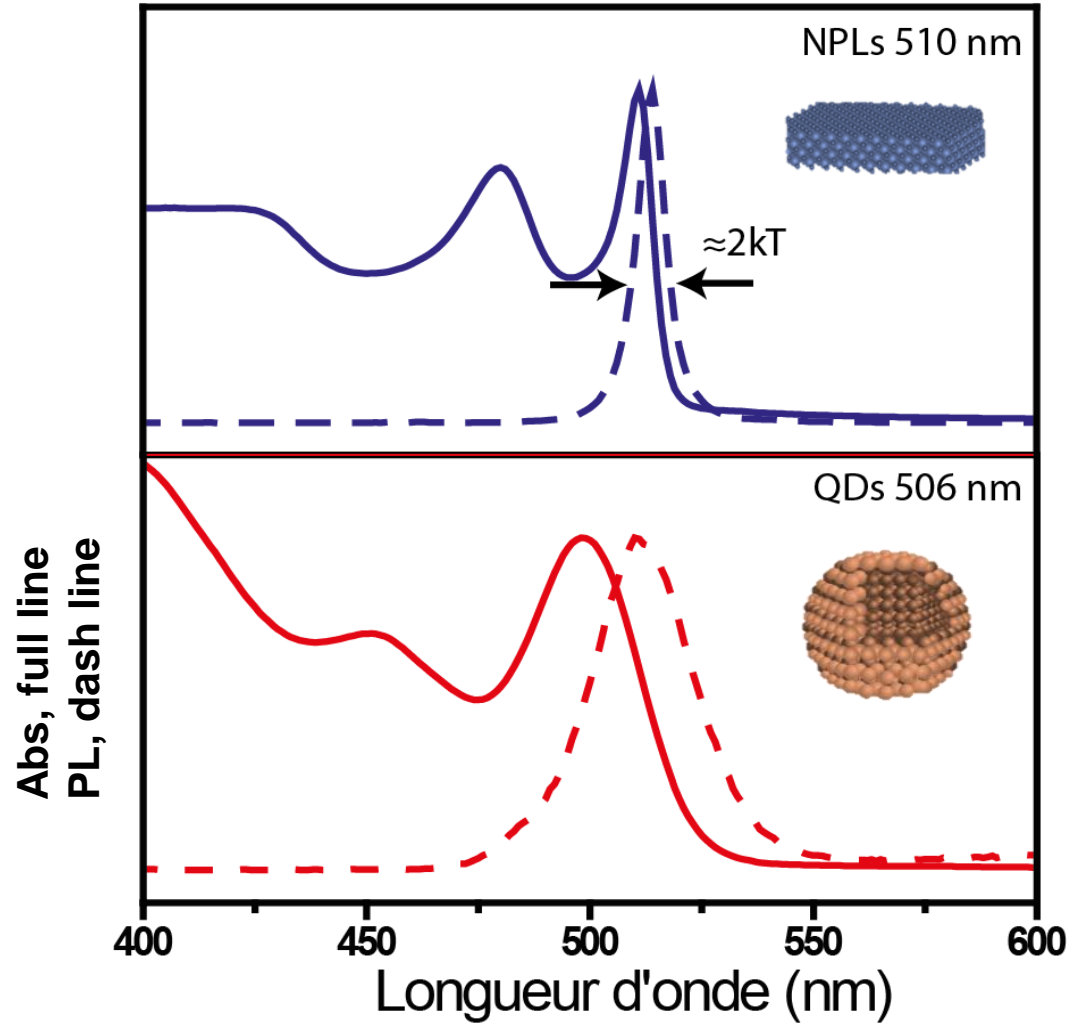
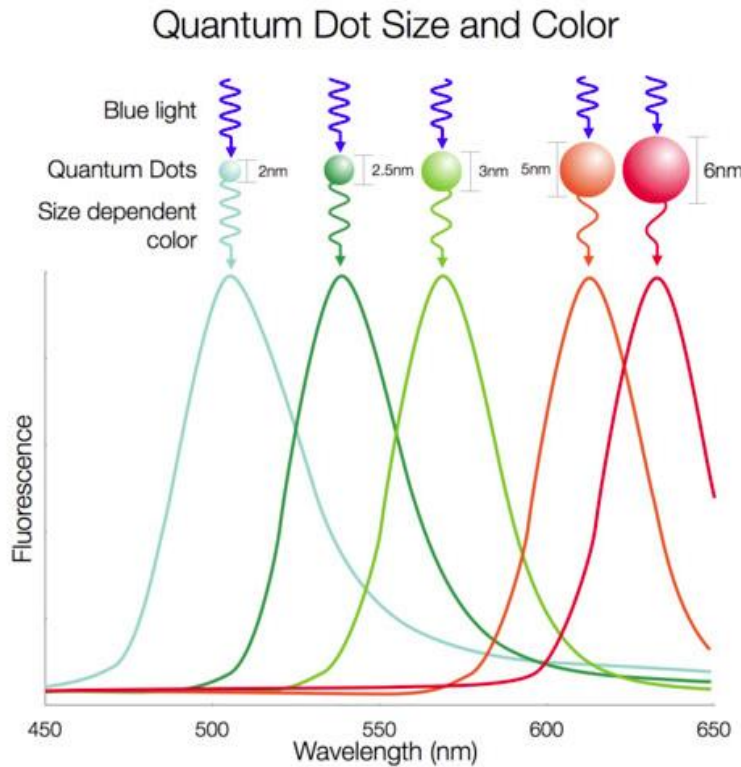
Valence Band

- ❑ In a confined regime → 1 dimension smaller than Bohr radius
- ❑ Modifications of state densities → Optical properties

Quantum Dots technology
→ 3D CdSe semiconductors NPs

Monochromatic emitters
→ pure color

Color is size dependent
→ Quantum confinement



1D

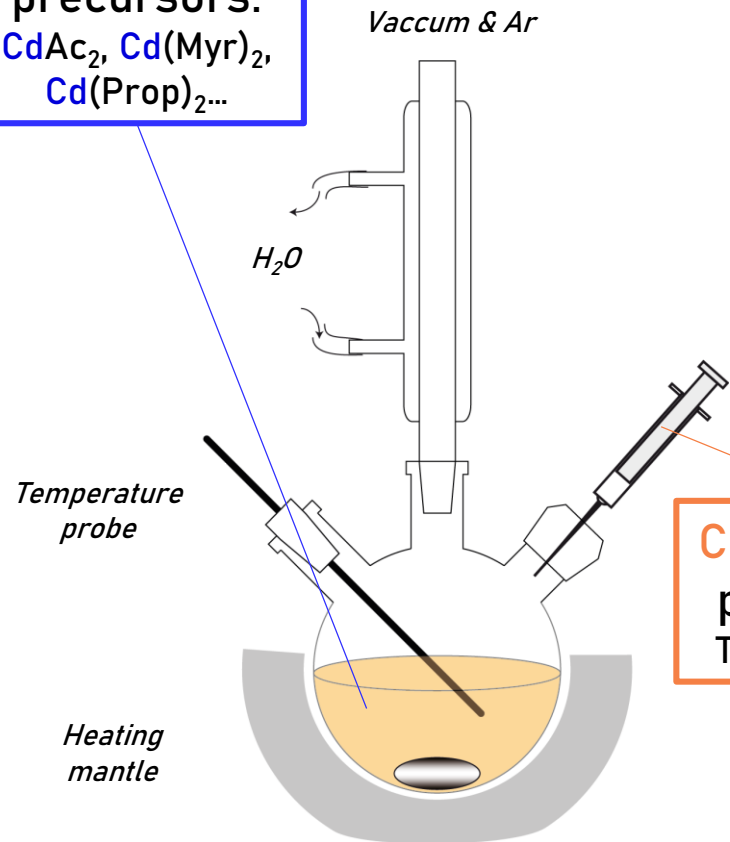
3D

□ NPLs → Narrower optical features

□ Confinement → Thickness → Controlled at the atomic scale

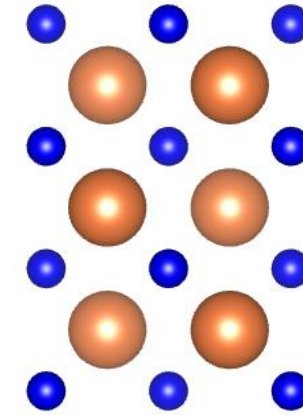
Synthesis of Nanoplatelets

Cadmium precursors:
 CdAc_2 , $\text{Cd}(\text{Myr})_2$,
 $\text{Cd}(\text{Prop})_2$...



Chalcogenide precursors:
 TOPSe , TOPTe ...

- ❑ Direct synthesis 2 to 5 ML
- ❑ Thickness controled at the atomic scale
- ❑ Oleic Acid colloidal stability

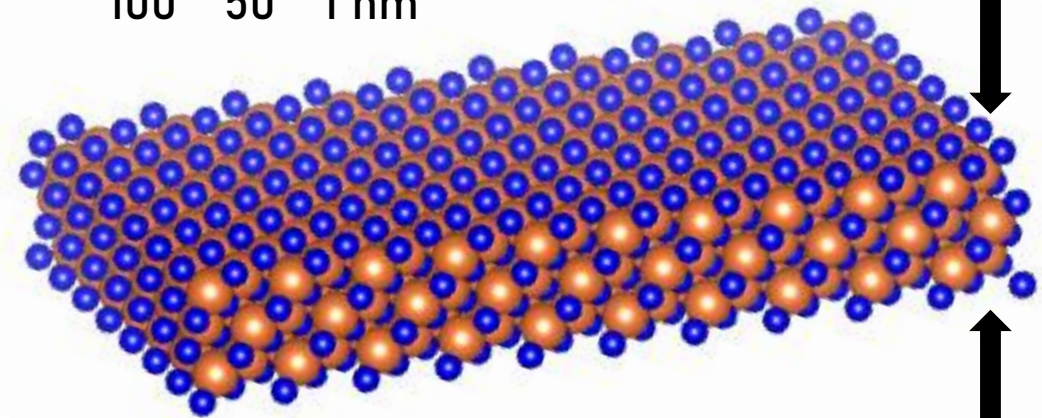


CdSe 3 ML

4 planes of Cd

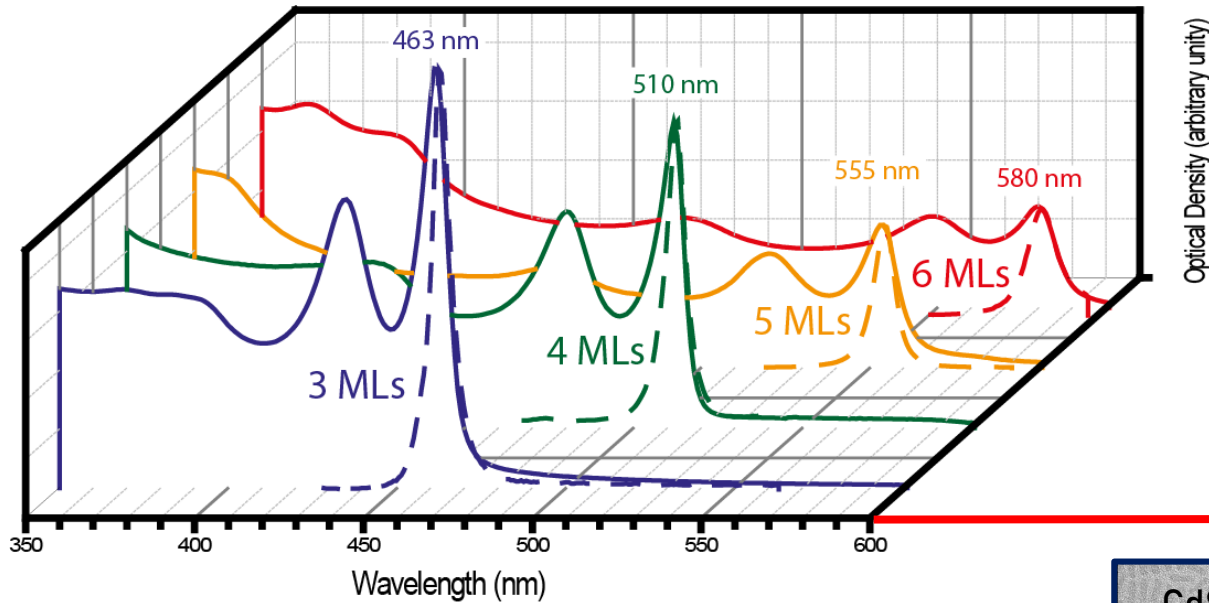
3 planes of Se

100 * 50 * 1 nm



Zinc-blende

Optical Properties of 2DNCs

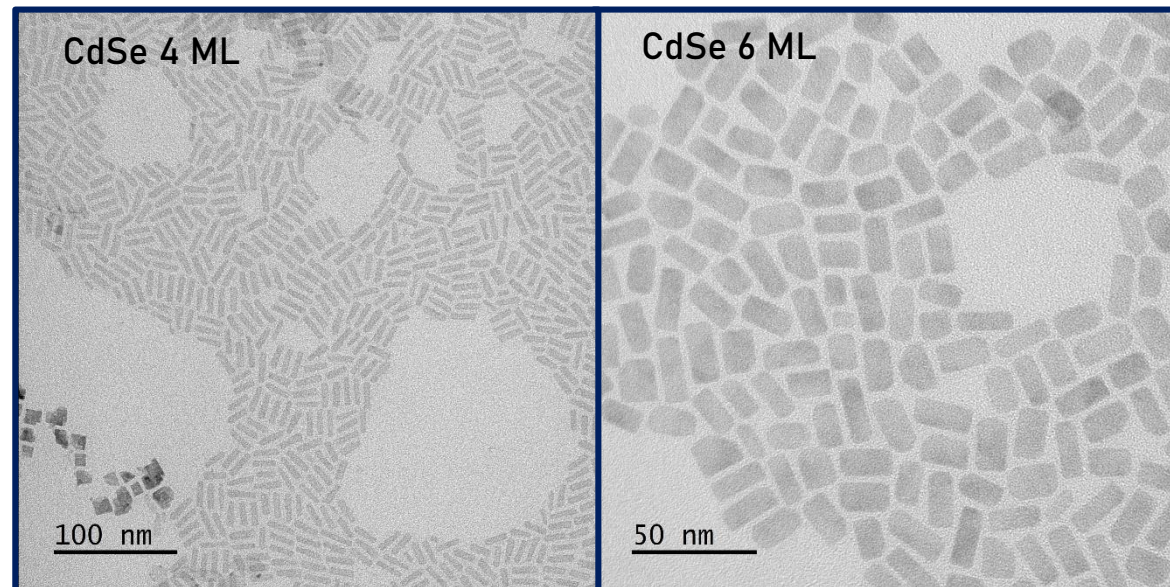


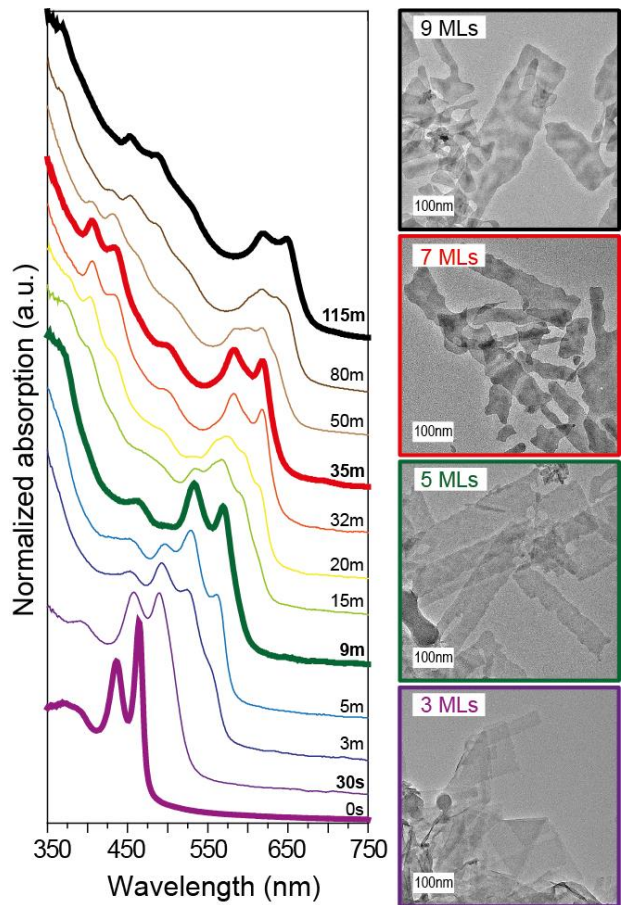
Next challenge IR

- Smaller BandGap
- Thicker NPLs

λ

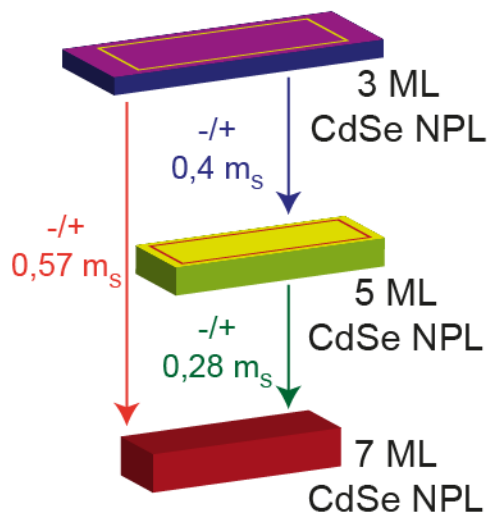
- Optical properties monitored with the thickness
- Narrow optical features and no inhomogeneous broadening





From N to N+2 monolayers
NPLs starting with 3 MLs NPLs
by surface energy modification

!!!



Ne2DeM 853049

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ESPCI PARIS | PSL

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Ithurria

Thank you for your attention