

Blue-emitting CsPbBr₃ nanoplatelets with sub-ns decay

COST FAST WG2 meeting in Prague

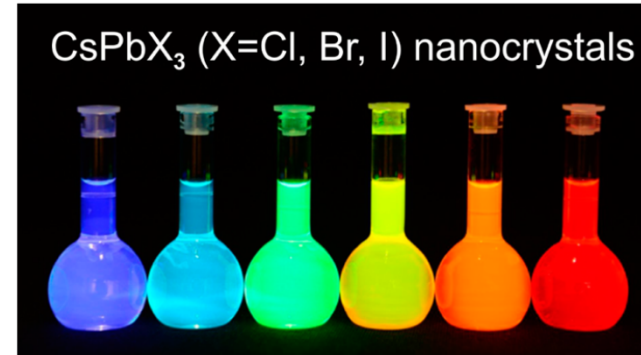
14th June 2018

Kateřina Tomanov



Czech Technical University in Prague

CsPbX₃ nanocrystals



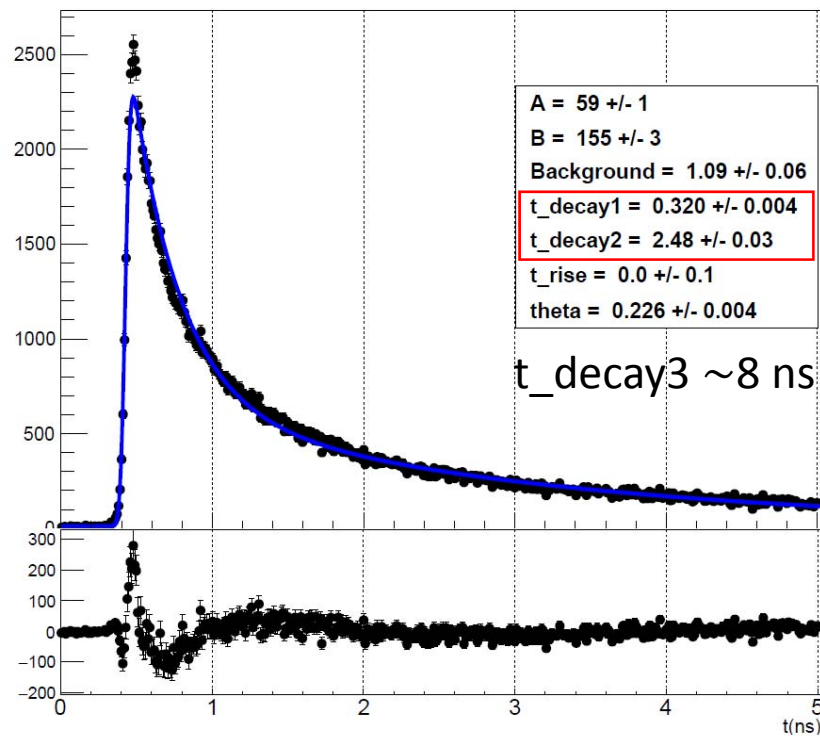
Protesescu et al., 2015

- X = Cl, Br, I
- Cubic perovskite crystal structure
- Excellent photoluminescence properties:
 - High quantum yield (up to 90 %)
 - Narrow emission line widths
 - Short radiative lifetimes (1 – 29 ns)
- Emission spectra are tunable over the entire visible spectral region
- Optoelectronic applications (LEDs, displays, photovoltaics)

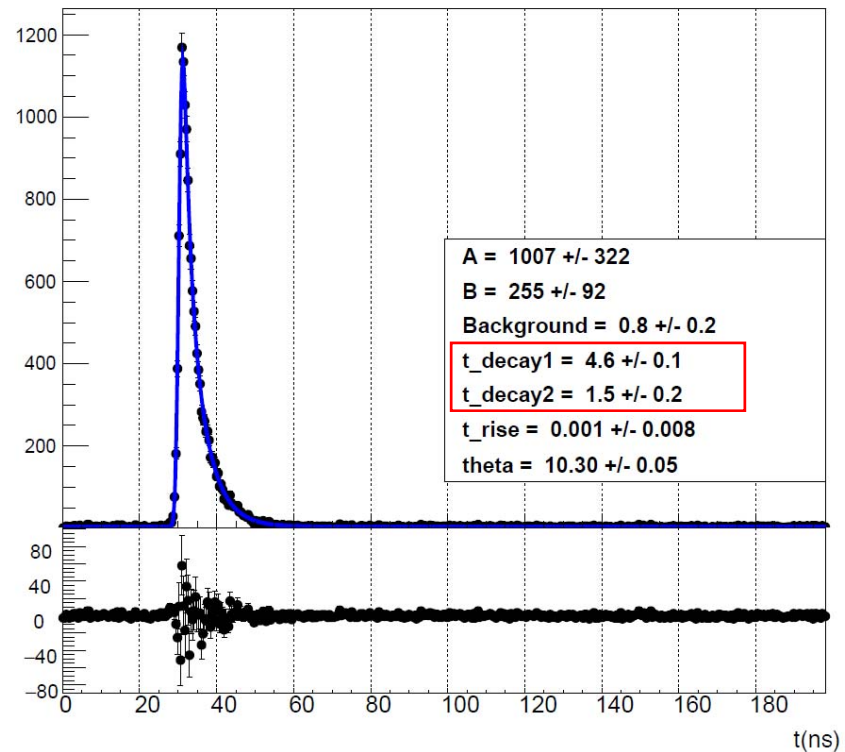
Ref.: L. Protesescu, et al., 2015, *Nano Lett.* **15**, 3692–3696, DOI: 10.1021/nl5048779

First experiments – results (PL decay)

- Photoluminescence under laser excitation (372 nm)
- Measured at CERN by Rosana Martinez Turtos
- Blue vs. green emission (blue: fast component – 320 ps!)



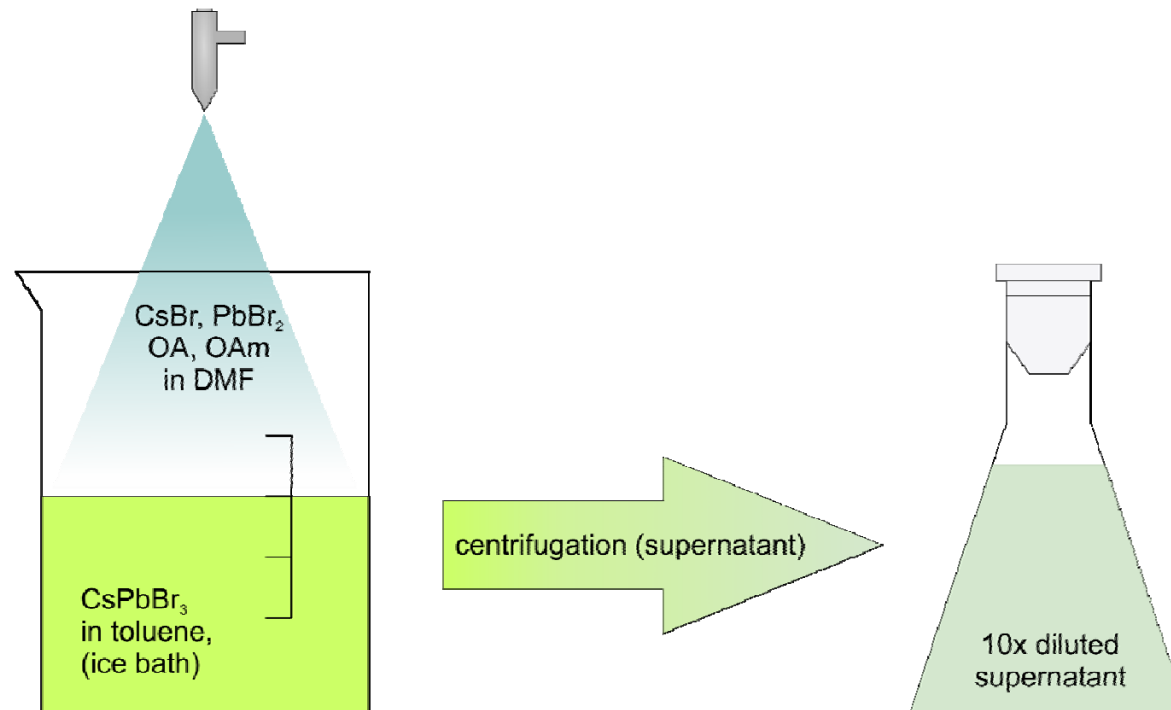
Blue



Green

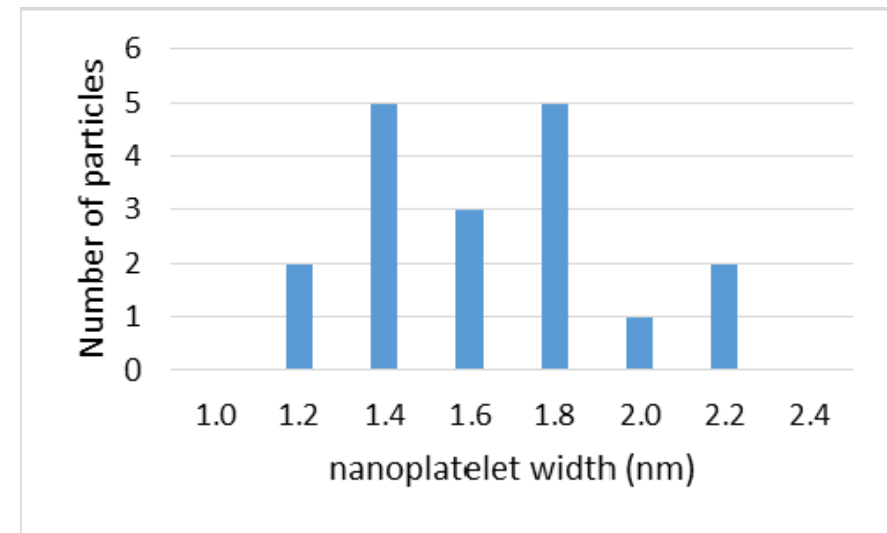
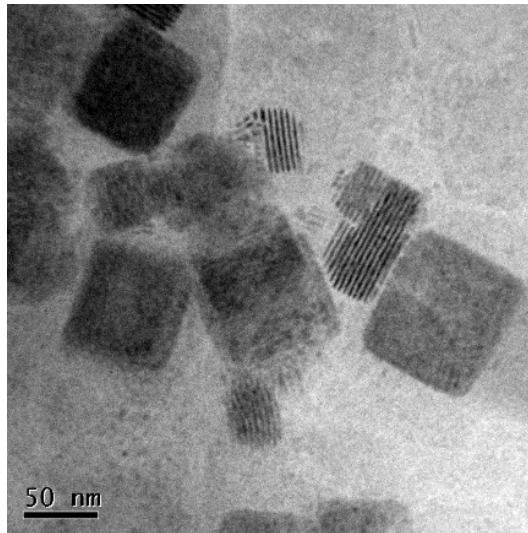
Synthesis optimization

- The smallest particles (strong quantum confinement)
- Better stability of the colloidal solution



Results

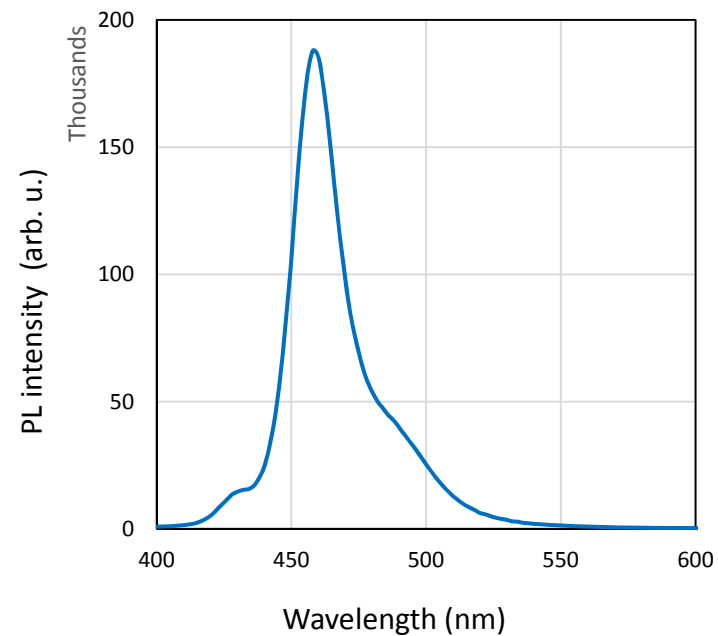
- CsPbBr₃ nanoplatelets (2 – 3 monolayers)



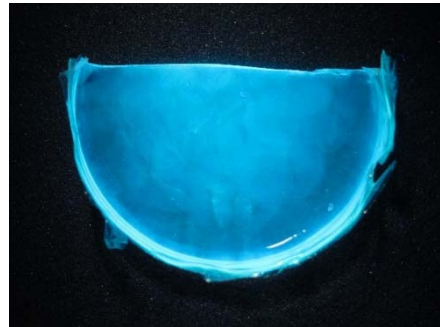
Results

emission	485 nm	fraction	460 nm	fraction	425 nm	fraction
decay 1 (ns)	0.9	46.2 %	2	61.3 %	1.5	44.7 %
decay 2 (ns)	4.5	51.3 %	5.9	38.7 %	4.8	46.0 %
decay 3 (ns)	15.7	2.5 %	-	-	13.5	9.3 %

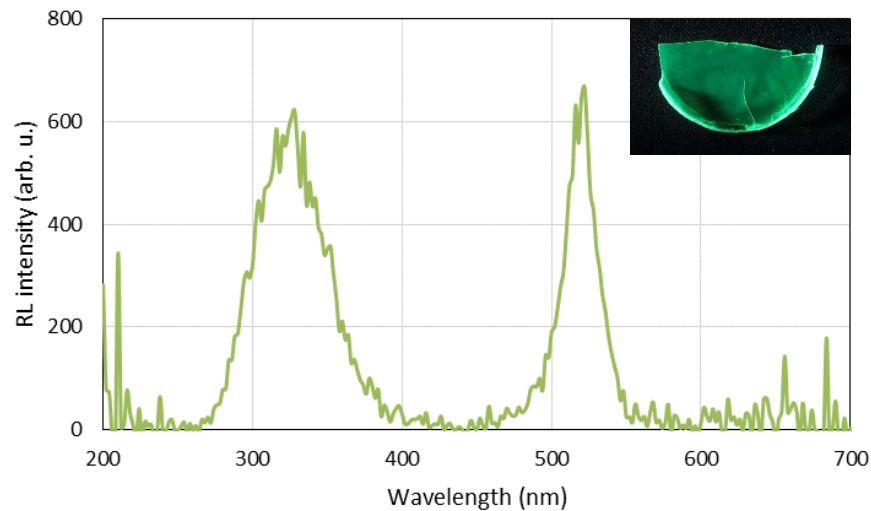
- Sub-ns emission in the blue region



Core-shell structures



- Nanocrystals embedded in the polystyrene
- Problems with stability of PS to solve
- Core-shell CsPbBr₃@SiO₂ – in progress



Conclusions

- New progress in the field of CsPbBr₃ nanocrystals
- Nanocrystals with the blue emission successfully separated
- Problems with stability of PS to solve
- Core-shell CsPbBr₃@SiO₂ – in progress