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Physics and Chemistry of Nanostructures Group

Ultrafast Phase Modulation in CdSe Colloidal Quantum Wells

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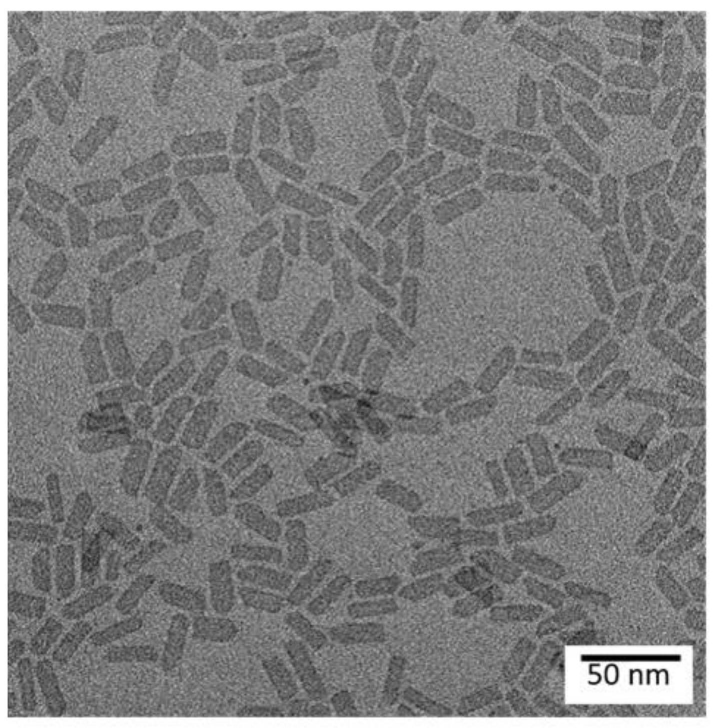
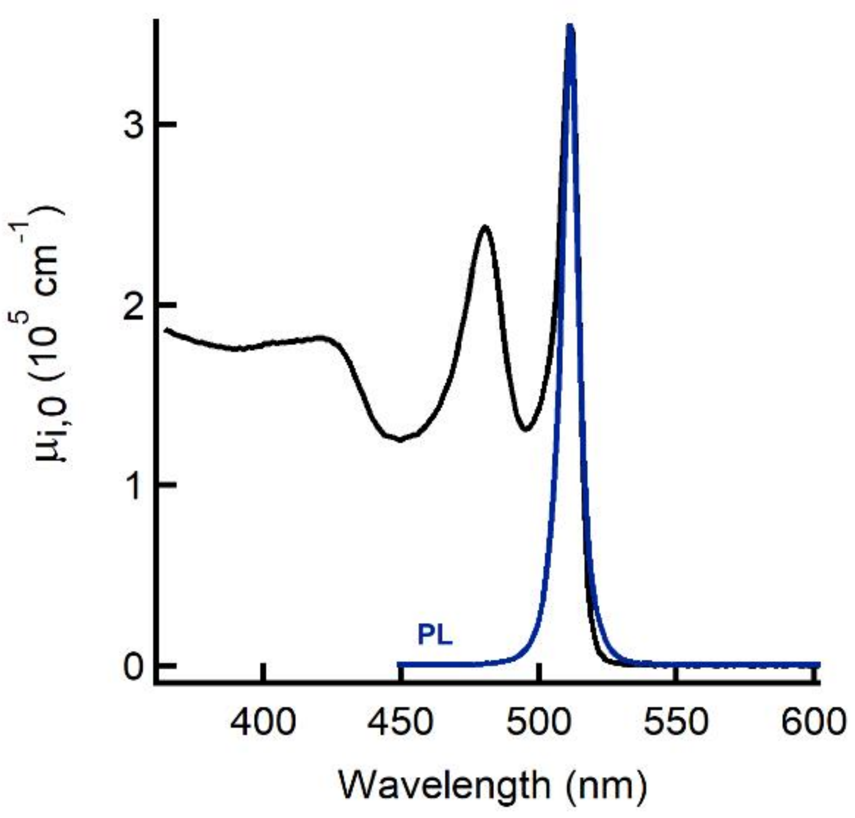
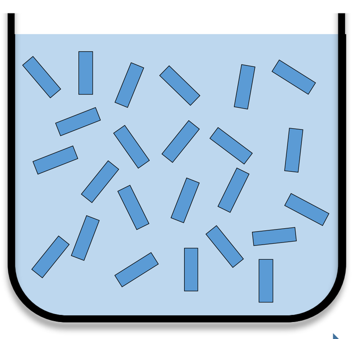
Colloidal nanomaterials recently gained much attention because of a rise in application possibilities as emitters and detectors in various wavelength fields. At the University Of Ghent, we are developing various colloidal materials to be integrated in optical waveguides to create optically pumped lasers, electrically pumped LEDs and photodetectors. However, in integrated photonic circuits, the phase of the light is of high importance to maintain coherence. As such, it is necessary to understand the refractive index of the material. We have developed a script to iteratively determine the refractive index of a colloidal nanomaterial of any geometry, using the Maxwell-Garnett effective medium approach (MG approach), and the Kramers-Krönig relation (KK-relation), with the only required input being the depolarization factors and the absorption spectrum, and as a case study we have applied this on colloidal quantum wells, for both linear and transient absorption spectra.





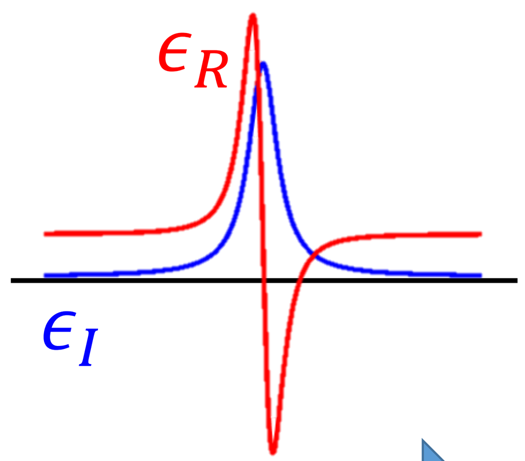
START

A
(ν_x, ν_u, ν_z)
$\epsilon_{I,0}, \epsilon_{R,0}$



MG approach

$\tilde{\epsilon}_I$



$KK - relation$

$\tilde{\epsilon}_R$

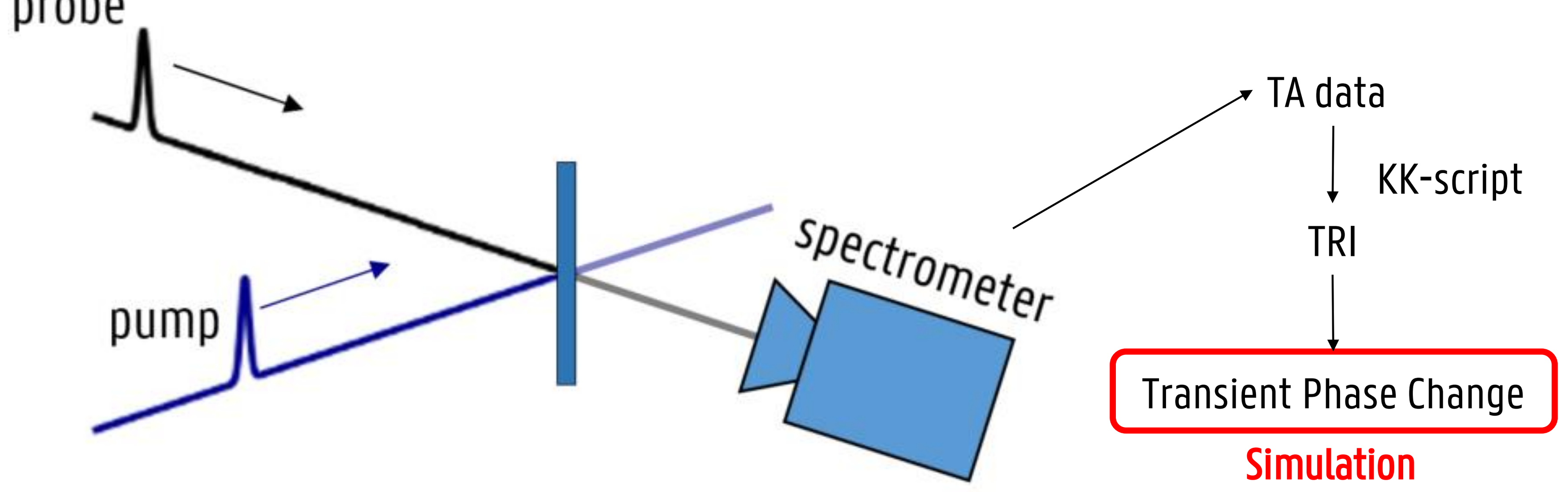
$$n = \frac{\sqrt{2}}{2} \cdot \sqrt{|\epsilon| + \epsilon_R}$$

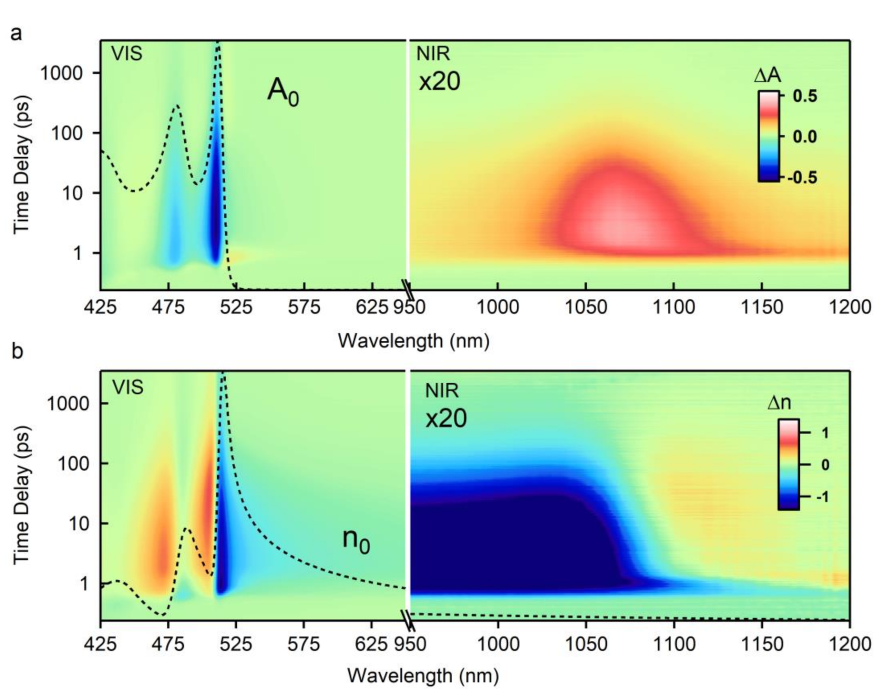
$$\kappa = \frac{\sqrt{2}}{2} \cdot \sqrt{|\epsilon| - \epsilon_R}$$

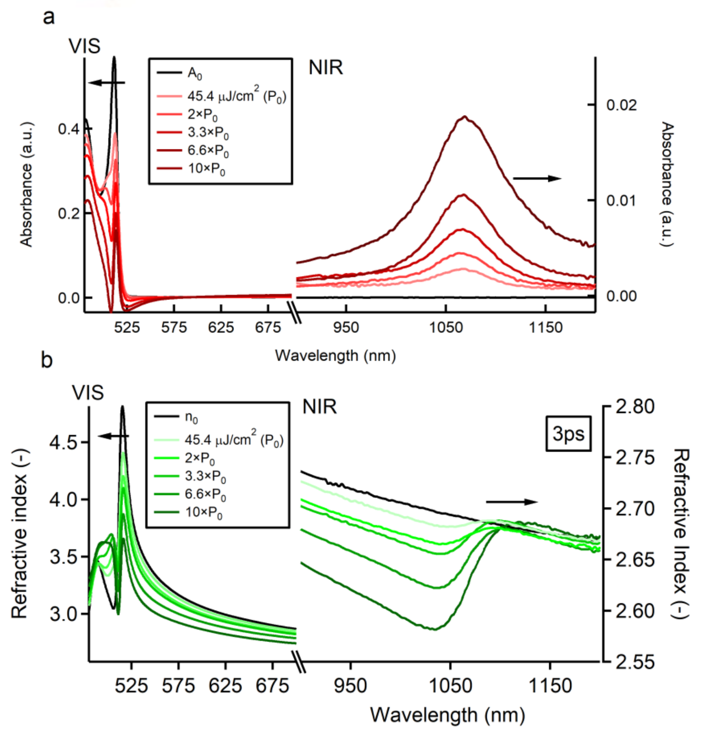
END

(ϵ_I, ϵ_R)
(n, κ)

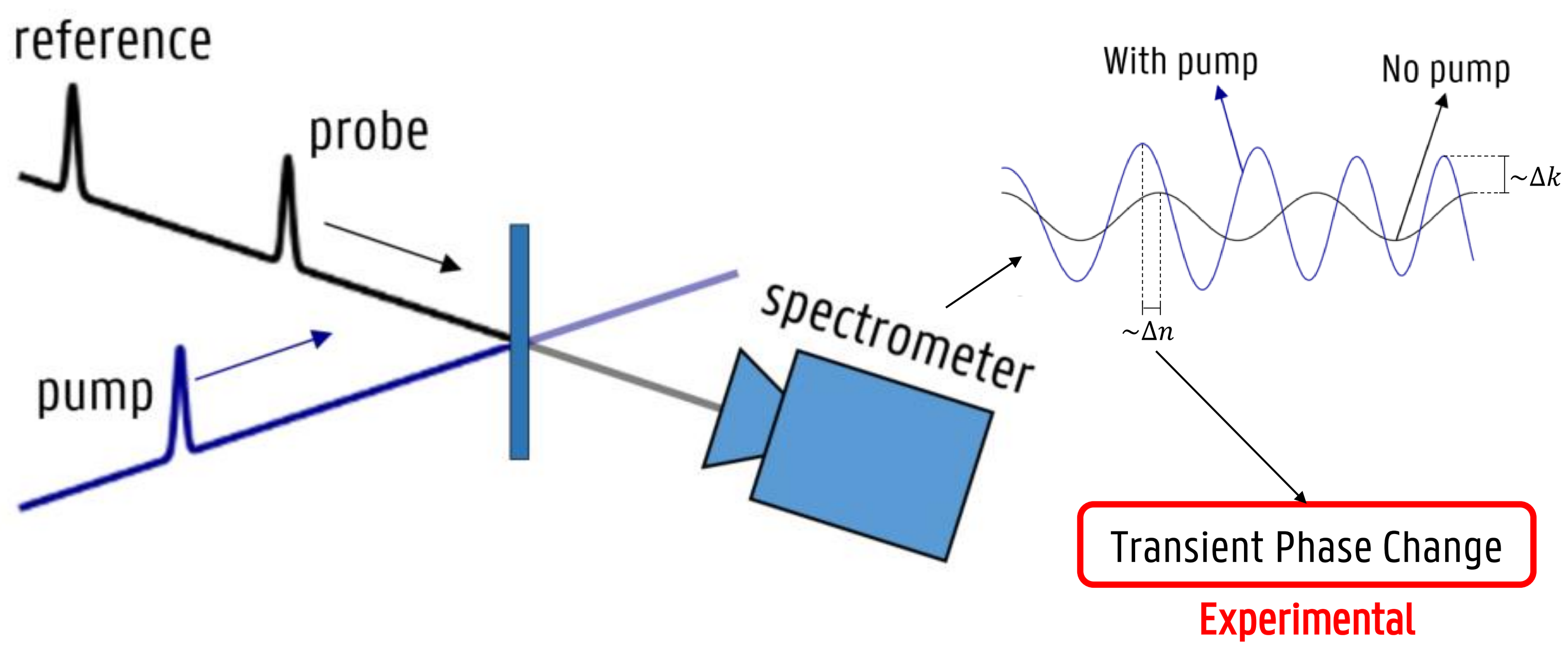
Transient Absorption Spectroscopy to Transient Refractive Index

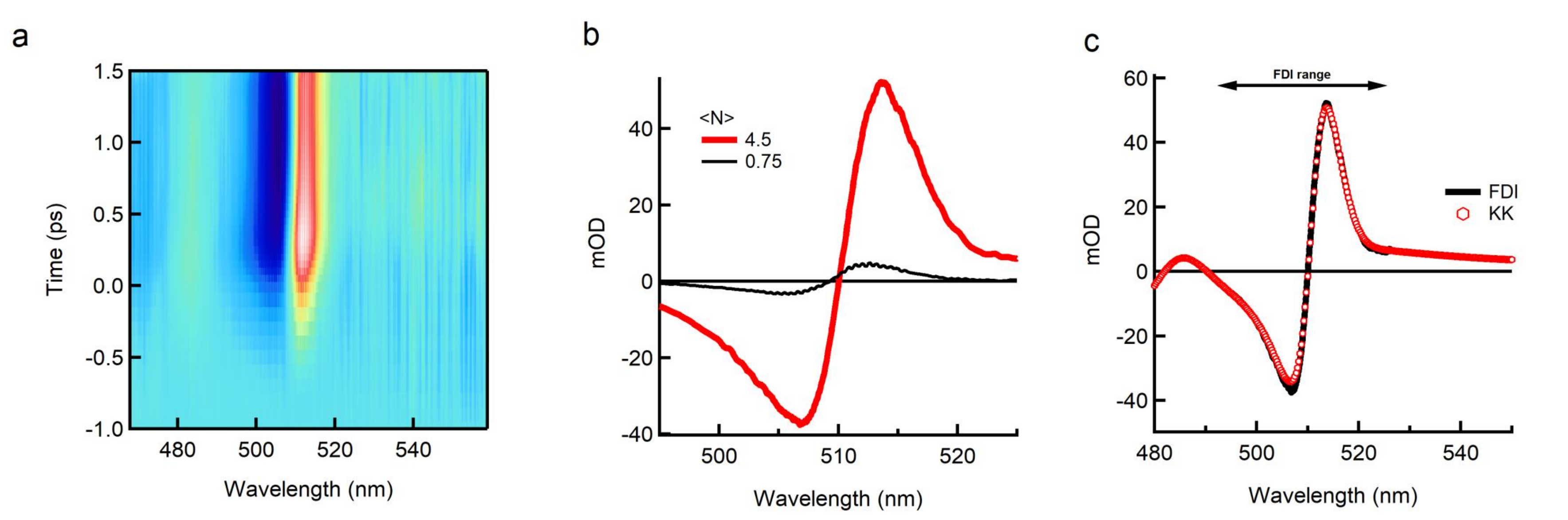






Frequency Domain Interferometry





References

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3. Alves-Santos, M. *et al.*, J. Phys. Chem. C 2010, 114, 3776–3780
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nanoGe Fall Meeting (#NFM18)

IMPORTANT INFORMATION

SYMPOSIA	ROOM	FLOOR
S1 #SolFuel18	MEDITERRANEO A+B+C	1
S2 #WatSpl18	MEDITERRANEO A+B+C	1
S3 #NCFun18	TORREMOLINOS A+B	0
S4 #NCPhot18	TORREMOLINOS A+B	0
S5 #Dynano18	MONDAY/TUESDAY MEDITERRANEO E+F	1
	WEDNESDAY MEDITERRANEO D+E+F	1
S6 #Sol2D18	TORREMOLINOS D+E	0
S7 #PerFun18	TORREMOLINOS D+E	0
S8 #PerMod18	TORREMOLINOS C	0
S9 #PVCon18	MEDITERRANEO D	1
S10 #SPMEn18	TORREMOLINOS C	0
S7+8	TORREMOLINOS D+E	0

Symposia

2018 October 22-26, Torremolinos, Málaga, Spain.

S1 Solar Fuel (#SolFuel18)
Enabling solar as a primary energy source requires not only efficient conversion devices but also the ability to store energy in molecular bonds – i.e. solar fuels. This symposium will provide an interdisciplinary forum for discussion between materials scientists, physicists, chemists, and device engineers whose common goal is to advance the applications of emerging materials and molecular system in efficient and robust solar fuel production. Topics of interest include but are not limited to photoelectrochemical and photocatalytic approaches for water splitting or CO2 reduction. Interfacial band-edge energetics and aspects of catalysis and charge transfer will be particularly emphasized. Emerging novel materials, molecular systems and hybrid approaches will be highlighted.

Organizers:
Kevin Sivula, École Polytechnique Fédérale Lausanne, CH
Shannon Boettcher, University of Oregon, US

https://www.nanoge.org/NFM18/program/symposia-programs

Thorben Petersen, Thorsten Klüner	Quantum Chemical Investigation of Water Splitting on ideal TiO2-Anatase(101)
Oleksandr Mashkov, Mykhailo Sytnyk, **Wolfgang Heiss**	Organic Pigments Nanoarchitectures for Heavy Metal Removal from Water
Niall Killilea, Mingjian Wu, Mykhailo Sytnyk, Amir Amin, Erdmann Spieker, Wolfgang Heiss	Bulk-like PbS Nanocrystals with Epitaxial Ligands Providing Photodetection Beyond 3000nm
Kelly Brouwer, **Serena Busatto**, Anne Berends, Celso de Mello Donegá	Formation of Ultrathin Colloidal Copper Indium Sulfide Nanosheets by Cation Exchange in Cu2-xS and In2S3 Nanosheets
Sotirios Christodoulou, Juan I. Climente, Josep Planelles, Rosaria Brescia, Mirko Prato, Beatriz Martín-García, **Ali Hossain Khan**, Iwan Moreels	Widening the Thickness Range of Colloidal CdSe Nanoplatelets with CdCl2
Emanuel Ronge, Natalie Ottinger, Thorsten Cottre, Katharina Welter, Vladimir Roddatis, Vladimir Smirnov, Friedhelm Finger, Bernhard Kaiser, Wolfram Jaegermann, Christian Jooss	Post-Mortem Electron Microscopy Analysis of Integrated Devices for Photoelectrochemical Water Splitting
Ivo Tanghe, Lukas Elsinger, Suzanne Bisschop, Zeger Hens, Pieter Geiregat, Dries Van Thourhout	Continuous Wave On-Chip Lasers Enabled by Colloidal Quantum Dots
Koichiro Ueda, Yoshiyuki Inaguma, Yusuke Asakura, Shu Yin, Ken-ichi Katsumata	β-TaON Oxynitride Synthesis Using (C6N9H3)n and its Photoelectrochemical Properties
Joanna Dehnel, Yahel Barak, Efrat Lifshitz	Optically Detected Magnetic Resonance of Mn2+ doped CdSe/CdS Core-Shell Seeded Nanorods
Prince Saurabh Bassi, Bennet Wildenauer, Sebastian Fiechter	Accessing the Performance of Fe2TiO5 based Photoanodes Fabricated via Pulsed Laser Deposition
Ivo Tanghe, Kai Chen, Renu Tomar, Shalini Singh, Iwan Moreels, Justin M. Hodgekiss, Dries Van Thourhout, Zeger Hens, Pieter Geiregat	Ultrafast Phase Modulation in CdSe Colloidal Quantum Wells
Sasa Lukic, Jasper Menze, Wilma Busser, Martin Muhler, Markus Winterer	Overview of Different Synthesis Routes of Zinc-Gallium-Oxynitride Nanoparticles from the Gas Phase and their Photocatalytic Activity
Gianluca Grimaldi, Ryan Crisp, Nicholas Kirkwood	Ligand Induced Control of Energy Level Alignment in QD Heterostructures