Unit of Materials and Optoelectronic Devices

University of Valencia

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I. Suárez, P.J. Rodríguez-Cantó and J.P. Martínez-Pastor

Current State of the work

Phone Conference March 2th 2015

ICMUV
INSTITUT DE CIÈNCIA DELS MATERIALS de la Universitat de València

Outline

1-Deliverables and milestones

2-Current Status of the work

2.1-Plasmonic amplifiers

2.2-Photodetectors based on QDs and polymers

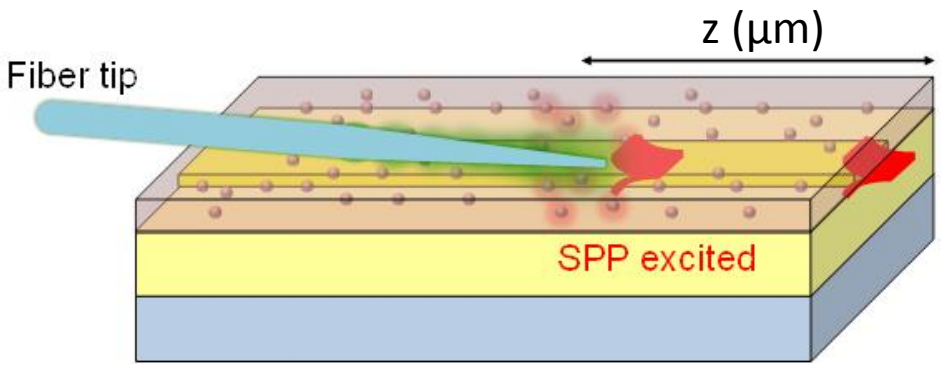
Deliverables and Milestones

	Names of the Milestones	Month	Partner
MS24	Demonstration of SPP amplifiers with electrical injection exhibiting 10dB/cm gain	30	UVEG

	Names of the Deliverables	Month	Partner
D4.5	Report on plasmonic photodetectors	33	UVEG

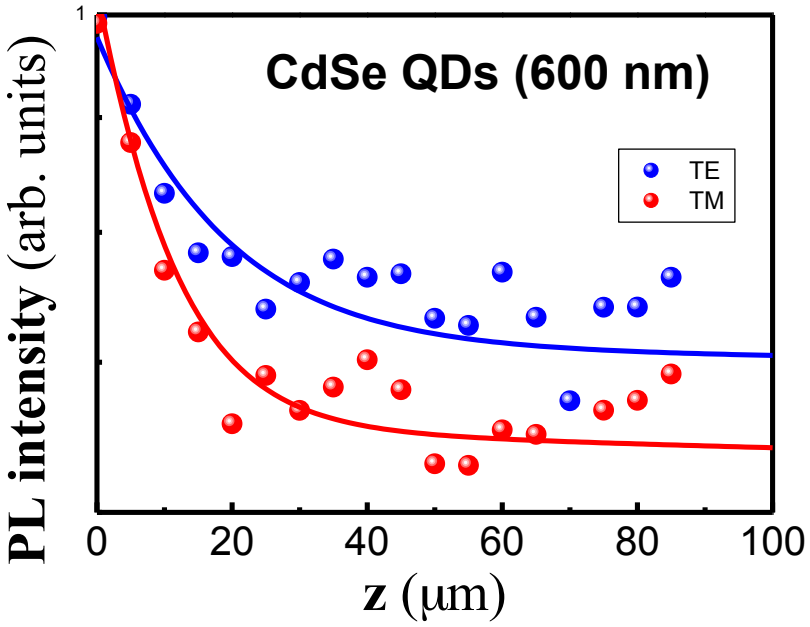
Plasmonics amplifiers

Method to characterize propagation length



- Fiber tip to obtain a small spot
- PL=f(z) to extrapolate LP
- Pump beam from the edge

- Lock-in amplifier to isolate pump and probe



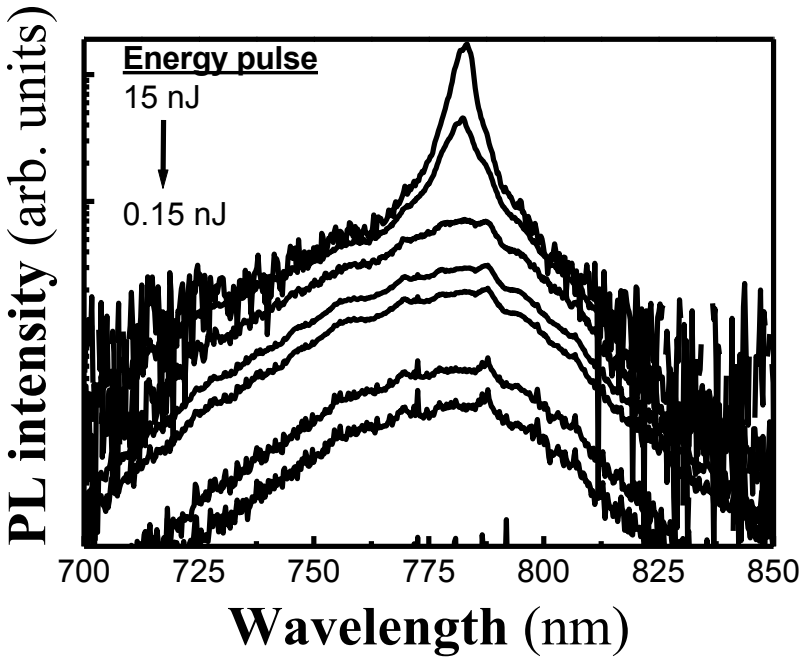
- L_p= 10 μm (theoretical 11 μm)
- Low compensation (<50%)

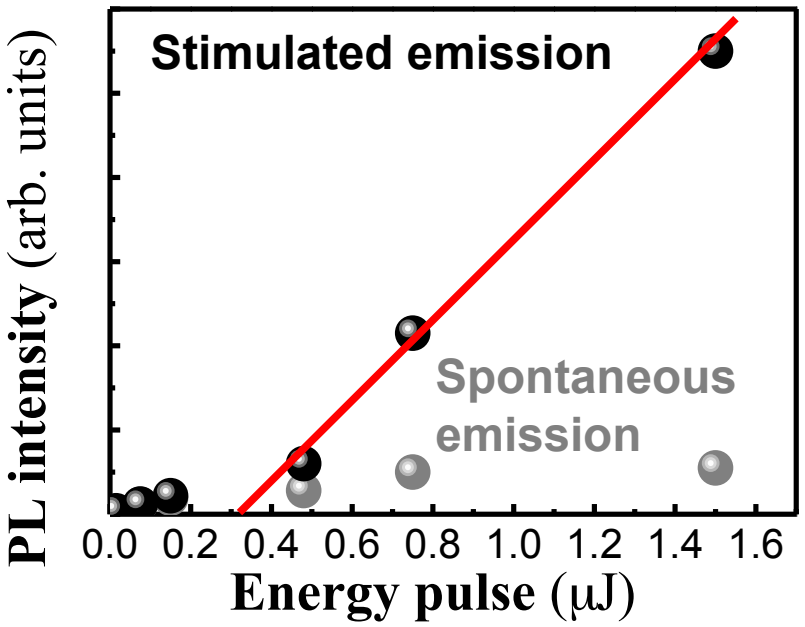
ALTERNATIVE MATERIALS TO DEMONSTRATE PLASMONIC AMPLIFICATION

Plasmonics amplifiers

Material with net gain in dielectric waveguides at 780 nm

Hybrid lead halide perovskite ($CH_3NH_3PbX_3$)* incorporated in planar dielectric waveguides demonstrates stimulated emission at 780 nm**



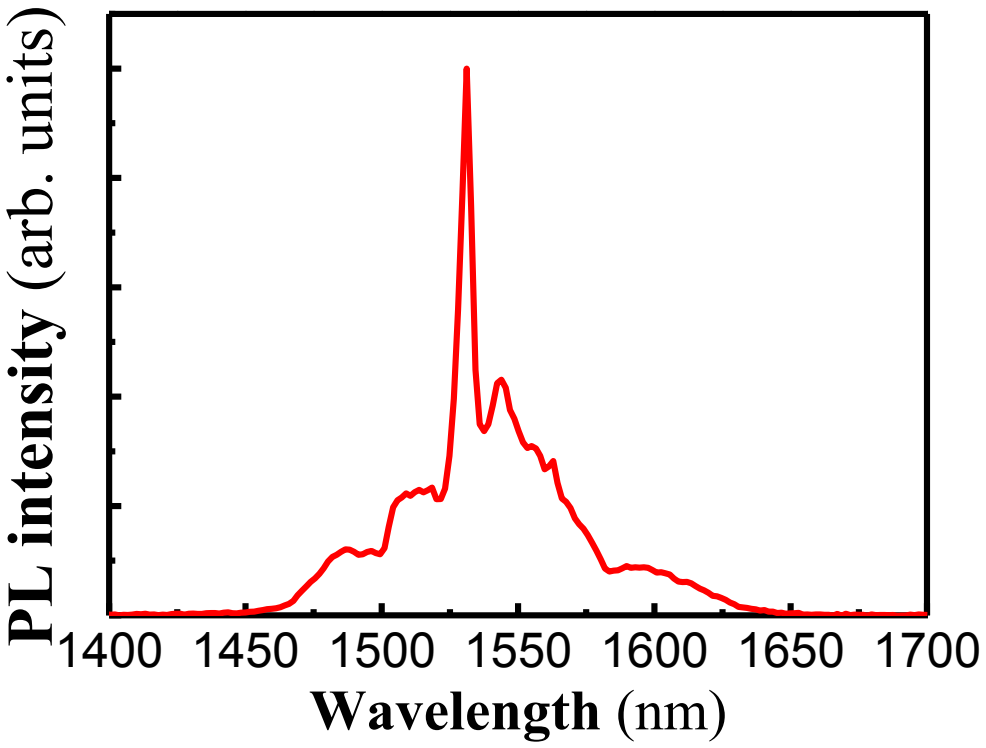


*Optoelectronic and Photovoltaic group, Jaime I University (Castellón, Spain)
** paper under review

Plasmonics amplifiers

Material in dielectric waveguides at 1550 nm

Nanoparticles* with Er-Yb ions incorporated in polymer waveguides

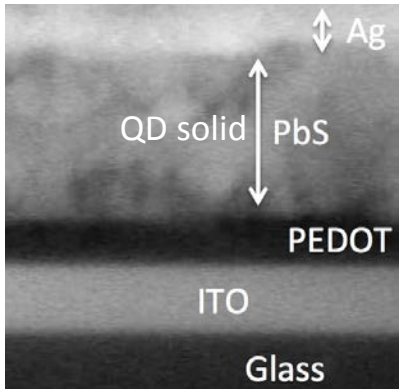


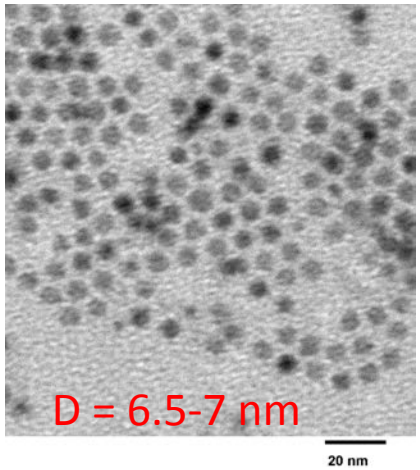
*Eugenio Cantelar, Universidat Autónoma de Madrid (Spain)

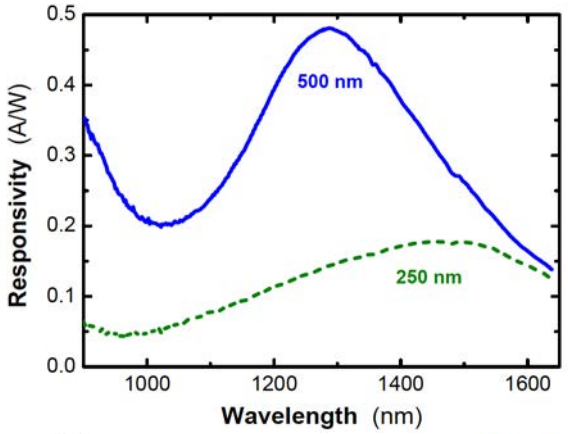
Photodetector

PbS-QD based Schottky photodiodes

The work developed until now on PbS-QD based photodiodes is being prepared for publication (MS23 was updated with the best results).
Further improvements will consist on the incorporation of a ZnO top electrode (current work) and metal NPs to increase light trapping ≈ antireflective coating).

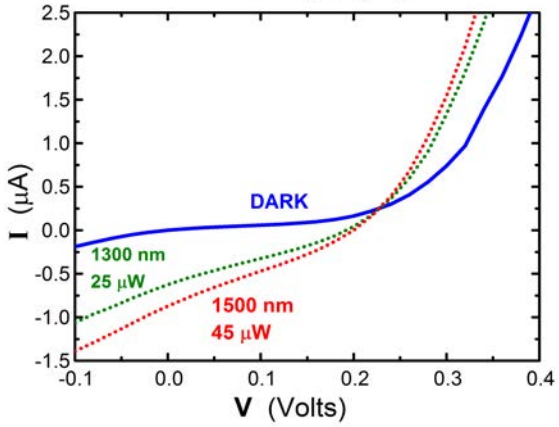






High responsivity

Large photocurrents (15-20 mA/cm^2 under AM1)



Large V_{oc} (reverse current increases under light)

Photodetector

PbS-QD based microgap photoconductors

Fabrication and test of different microgaps: dropping + MPA ligand exchange