

Spontaneous light emission modification from silicon nanocrystals coupled with surface plasmons.

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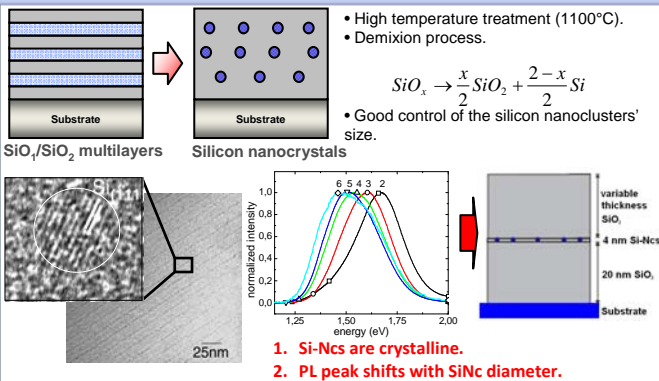
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Summary

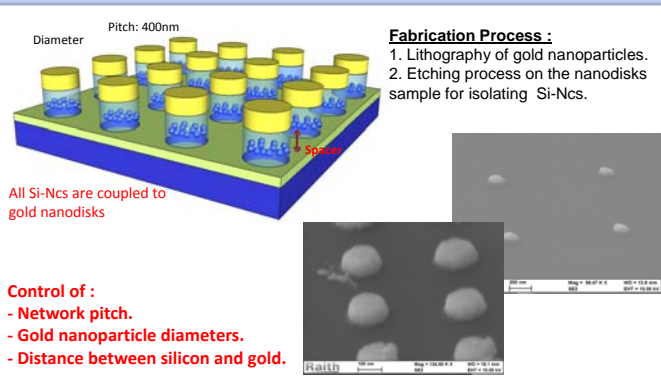
We report on the coupling between silicon nanocrystals and gold nanoparticles. In the literature, an enhancement of luminescence was observed by those ones^{1,2}, but no quenching was observed for small distance between this two objects. In this work we show a quenching of luminescence for small distance by etching the nanocrystal layer in order to remove all nanocrystals uncoupled with gold nanoparticles. This kind of sample allows us to see also dipolar and quadrupolar mode of the plasmon thanks to the luminescence of nanocrystals.

Sample fabrication

Silicon nanocrystals (Si-Nc)

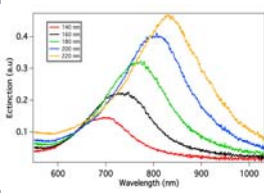


Hybrid Si-Nc/plasmonic nanodisk samples

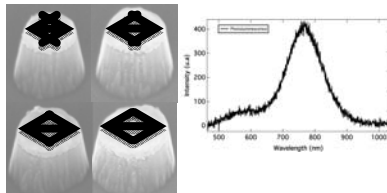


Results

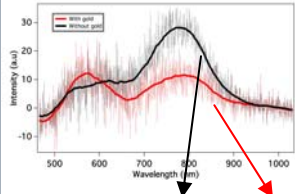
Plasmon resonance of gold nanoparticles



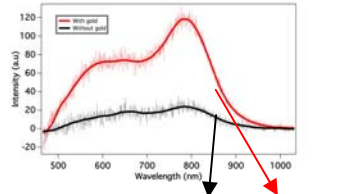
PL of Si-Ncs



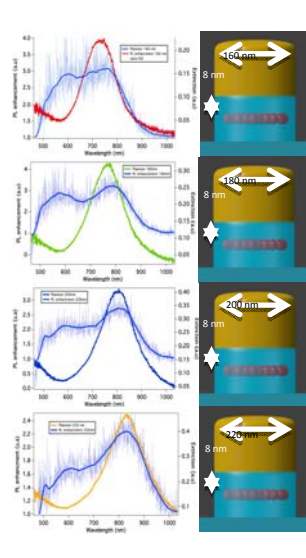
PL quenching



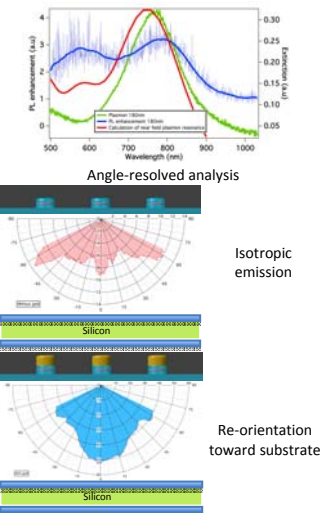
PL enhancement (6x enhancement)



Photoluminescence of silicon nanocrystals coupled to gold nanoparticles



Quadrupolar mode of the plasmon probed through Si-Nc PL of defects



Future work

- Time resolved measurements to understand physical phenomena.
- Application to down-conversion in photovoltaic devices.

Bibliography

1. J. S. Biteen, N. Lewis, H. A. Atwater, H. Mertens, and A. Polman, Appl. Phys. Lett. **88**, 131109 -2006.
2. J. S. Biteen, D. Pacifici, N. S. Lewis, and H. A. Atwater, Nano Lett. **5**, 1768 - 2005.