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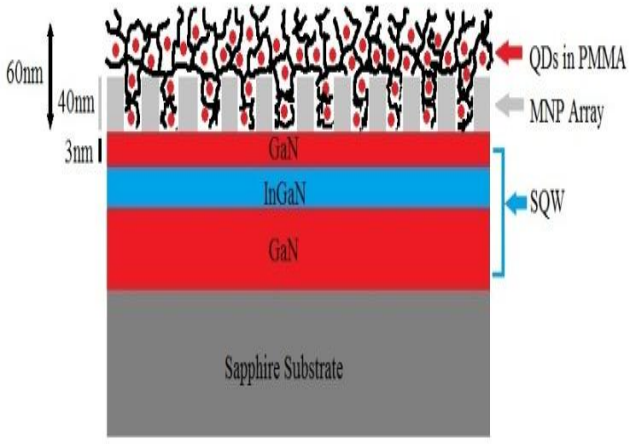
"Controlling Light in a Hybrid Quantum Well – Metal Nanoparticle – Quantum Dot System"

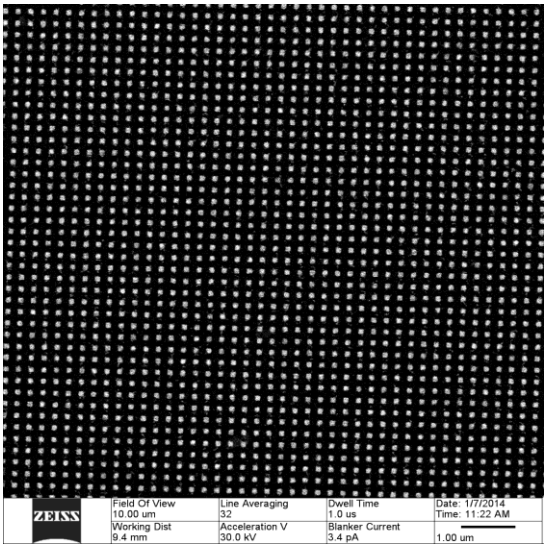
Abstract:

Quantum wells are fabricated from layers of semiconductor material (e.g. GaN and InGaN) to confine carriers in 2-D and therefore have specific emission properties. Excitons created in such materials can transfer energy (by radiative and non-radiative mechanisms) to a fluorophore (e.g. quantum dot) that is in close proximity. Metal nanoparticles can enhance such transfer mechanisms due to localized surface plasmons (LSPs). These LSPs effectively enhance the local electric field around the metal and can increase the energy transfer between the nanostructures. Nanoparticles of varying size, shape and periodicity were fabricated directly on QW samples using Helium-ion lithography to tune the LSP resonance. By tuning the LSP resonance peak we can observe different interaction with the QW and also with a layer of QDs embedded in PMMA.

This talk introduces how the MNP arrays interact with both the QW and the QDs; and also how they can be used to modify energy transfer across this hybrid structure.



Schematic of the hybrid QW-MNP-QD structure



Helium ion Microscopy image of an array of 100nm silver boxes