

Nano-scale Quantum Dot Photodetectors by Self-Assembly

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Objective of Research:

1. Place a quantum dot (QD) in small (~ 1 nm) gap between two electrodes using self-assembly.
2. Measure change in current through QD under light illumination.
3. Interpret results through modeling and characterize device as photodetector.

Motivation:

1. Nano-scale photonic integrated circuits are expected to outperform conventional VLSI technology in many areas including speed, bandwidth, integration density, and power consumption.
2. One important step to realizing photonic integrated circuits is the development of a nano-scale device that can measure small light intensity.

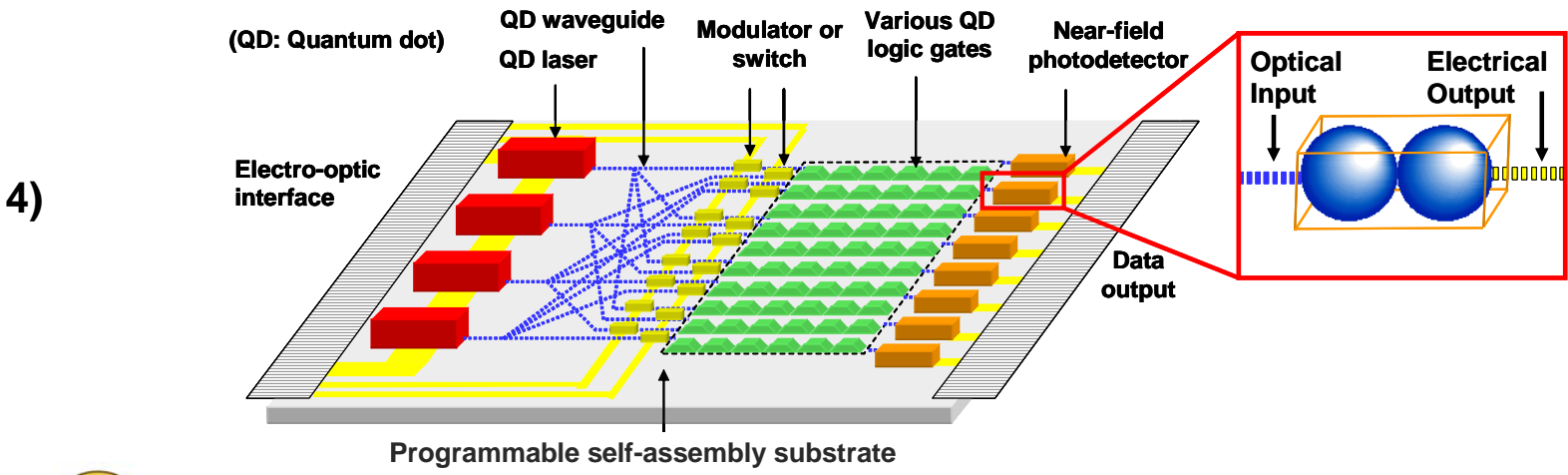
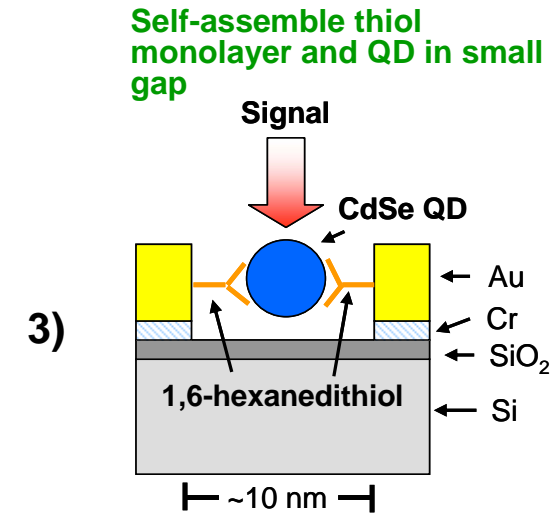
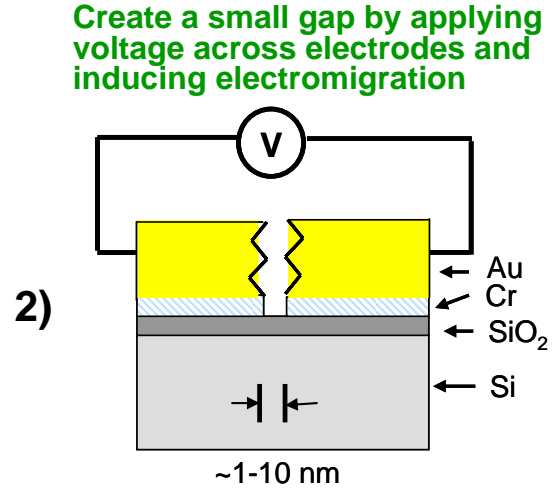
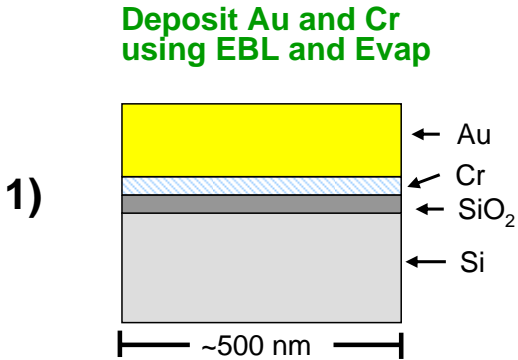


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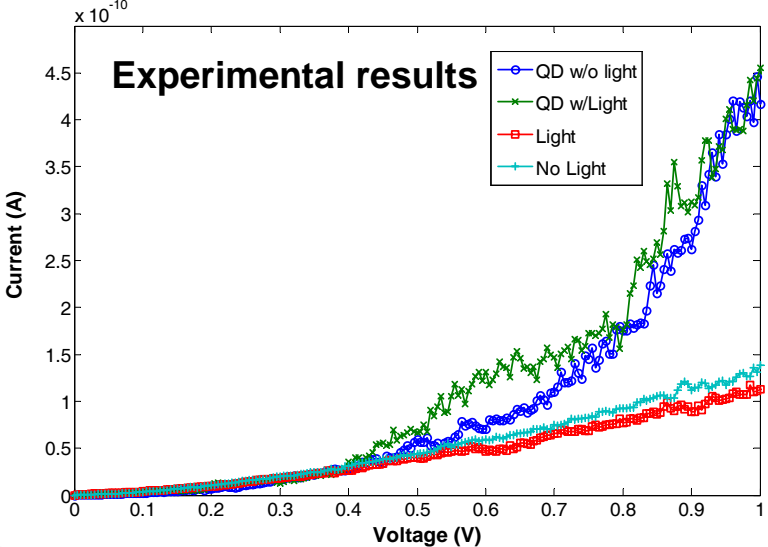
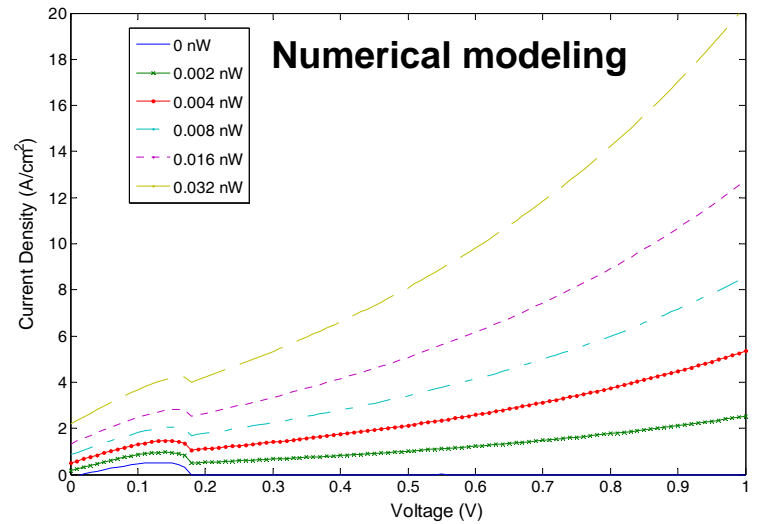
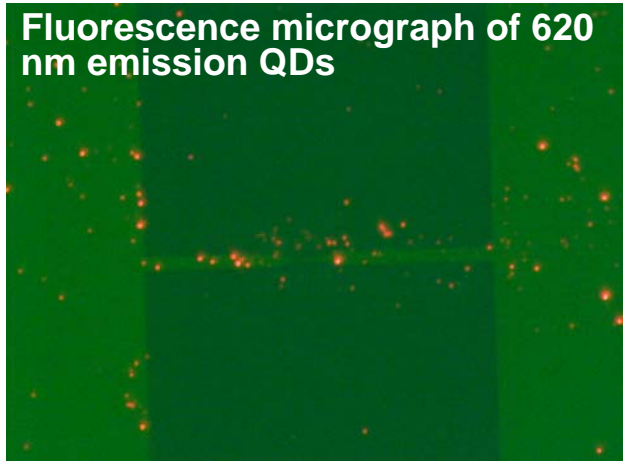
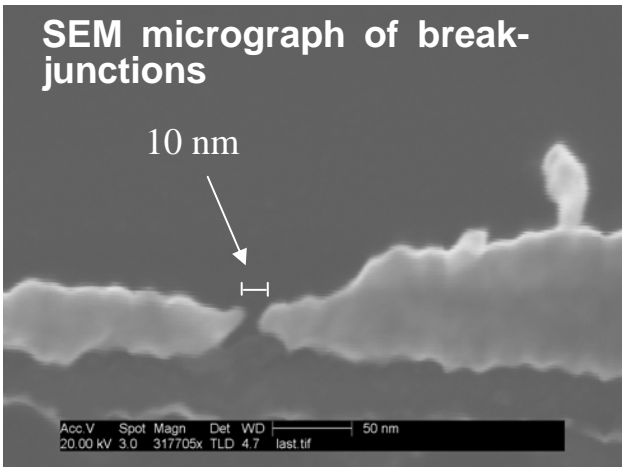
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Methodology:



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Preliminary Results:



Conclusions:

1. 1 – 40 nm gap
2. Self-assembly of QDs
3. Model for transport from 1st principles
4. Preliminary measurement under light illumination

Future Work:

1. Extend model to finite temp.
2. Characterize temp. dependence
3. Use laser as light source

