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It's Not How Small You Make It….

Evelyn L. Hu
John A. Paulson School of Engineering & Applied Sciences
Harvard University
Cambridge, MA 02138
ehu@seas.harvard.edu

Even before Feynman's prescient 1959 discourse, "There's Plenty of Room at the Bottom" [1], there was appreciation of the enormous potential of the world of the very small. Crafting a critical device dimension to be less than an electron scattering length allows us to observe *ballistic transport* without resistive loss. *Two-dimensional sheets of electrons* produced transistors with unprecedented mobilities. *Zero-dimensional quantum dots* with their distinctive electronic density of states promise light-emitting devices of exceptionally low thresholds. Yet for structures of nanoscale or atomic dimensions, it is not only "how small" we make the critical features: "how we make the structures small" is equally important. The "how" encompasses the materials properties that we might take advantage of, such as *strain* in the formation of epitaxial quantum dots, treatments of surfaces and interfaces, sculpting of materials with the highest spatial resolution and the lowest attendant damage. This talk will give some examples of "the how" in small structures that display exceptional photonic and electronic behaviour.

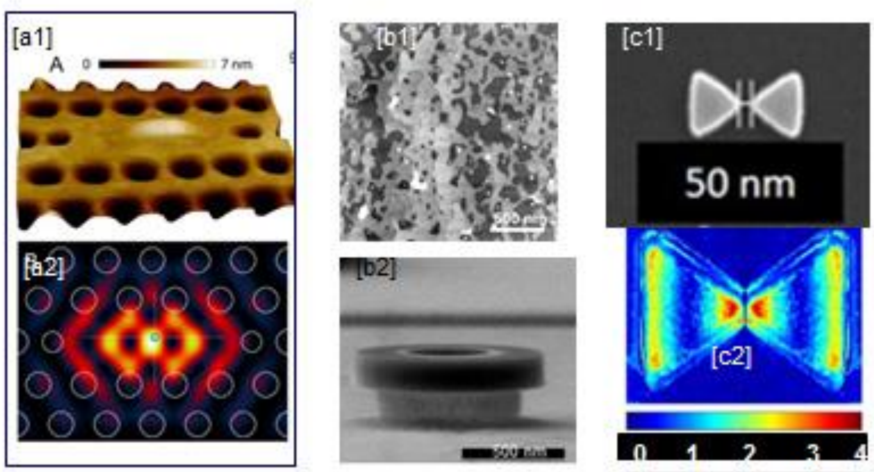

Figure 1. [a1}Atomic Force Micrograph (AFM) of a quantum dot within a photonic crystal cavity (PCC), and [a2} simulation of the electromagnetic (EM) fields in that PCC. [b2] AFM of InGaN quantum dots that are embedded within a [b2] micro-ring cavity. [c1] Scanning Electron Micrograph image of a plasmonic nano-antenna, and [c2] simulated EM fields in that nano-antenna.

References

[1] R.Feynman, "There's Plenty of Room at the Bottom", American Physical Society meeting, Dec. 29, 1959.