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Title:	The role of surface ligands in quantum-dot devices: Villain or unsung hero?
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The role of surface ligands in quantum-dot devices: Villain or unsung hero?

For over three decades, the study of nanocrystal quantum dots (QDs), which are solution-synthesized nanometer-scale bits of semiconductor materials, has produced singular advances in both our understanding of quantum confinement effects, and in our ability to make use of them in tech-relevant materials. Accordingly, QDs have found their way into the marketplace, specifically as high-performance fluorophores for, e.g., displays and biolabeling. In such applications, optimization of the QD surface, including the passivating ligands, is key to keeping photo-excited carriers from leaving the QD interior before recombining, resulting in a high fluorescence efficiency. Increasingly, attention has turned to realize the promise of QDs for optoelectronic applications (e.g., solar cells, LEDs, sensors) which require charge carriers to controllably enter, exit and/or travel through QDs, a much more challenging problem. In this scenario, the role of the QD surface must be completely reimagined, from being an impenetrable wall to being a gateway, or even a ramp. In this talk, I'll explore the inherent contrast between QD fluorophore and device applications, and describe how ligands, originally thought only to be impediments to QD electronic devices, may actually give the savvy QD device designer control over function and performance in a manner unknown in bulk semiconductor devices. Finally, I'll survey recent efforts at Los Alamos to develop a universal tool box for deposition of conductive QD films that may finally allow the manufacturing of economical, high-performance devices for a wide range of applications.