Plasmonic Properties of Silicon Nanocrystals Doped with Boron and Phosphorus

Supporting Information

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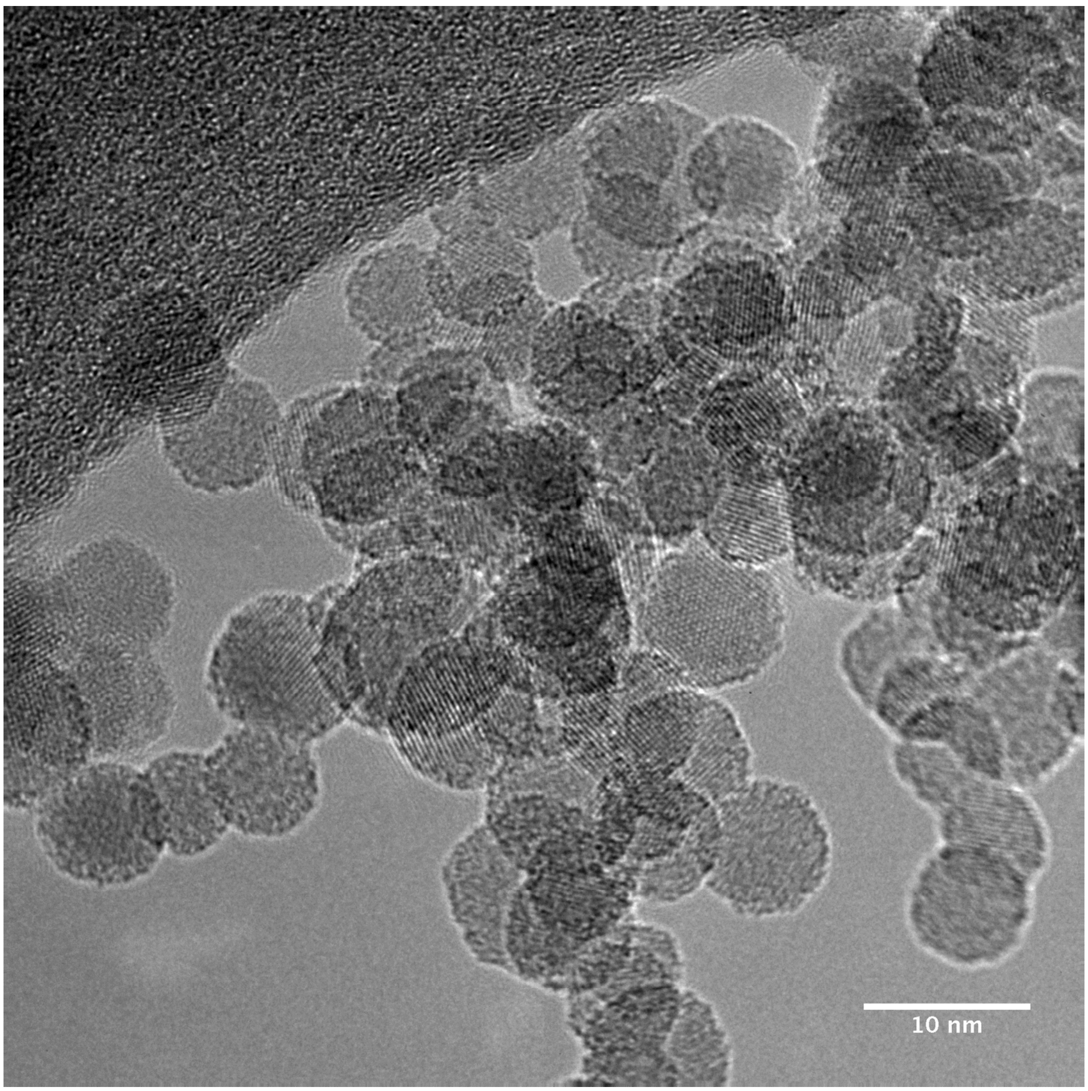

Figure S1: Transmission Electron Microscope image of the 8 nm silicon nanocrystals that were used in this study.

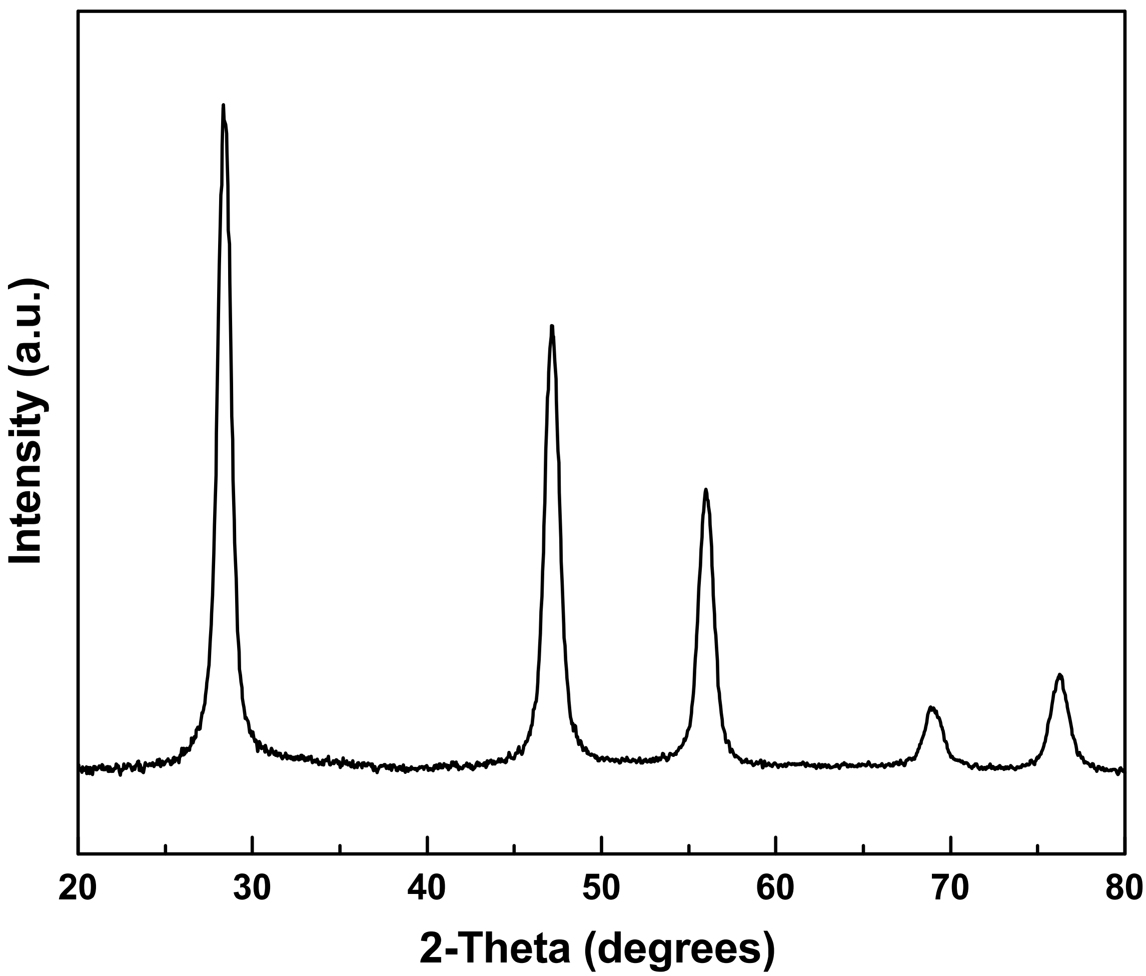

Figure S2: X-Ray Diffraction spectrum of silicon nanocrystals. The Scherrer equation gives an average size of 8.3 nm, which agrees well with the TEM results.

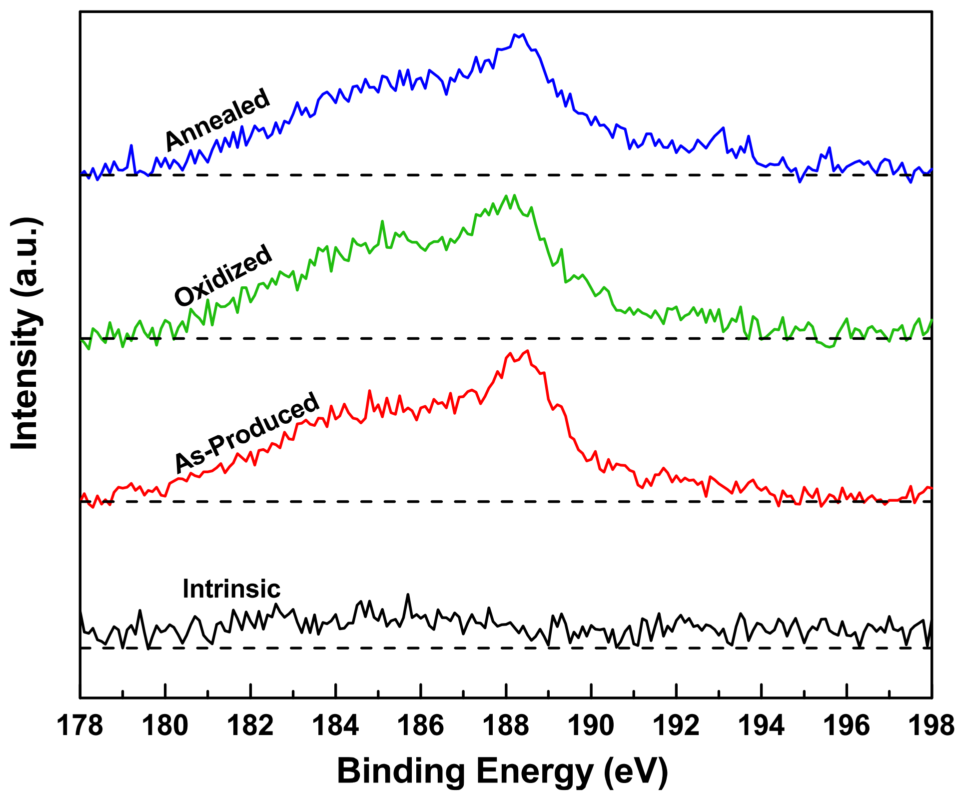

Figure S3: X-Ray Photoelectron Spectroscopy results for intrinsic (black) and boron-doped (red, green and blue) silicon nanocrystals. The spectra show the difference in the trivalent and tetravalent states of boron for as-produced and post-synthesis treated nanocrystals.

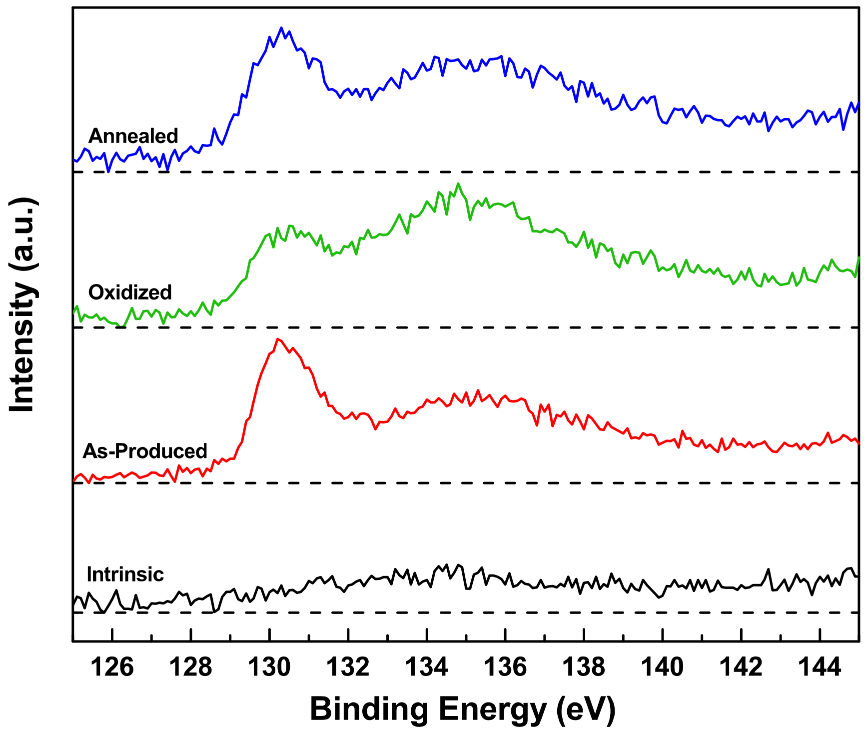

Figure S4: X-Ray Photoelectron Spectroscopy results for intrinsic (black) and phosphorus-doped (red, green and blue) silicon nanocrystals. The spectra show the difference in the bonding state of phosphorus for as-produced and post-synthesis treated nanocrystals.

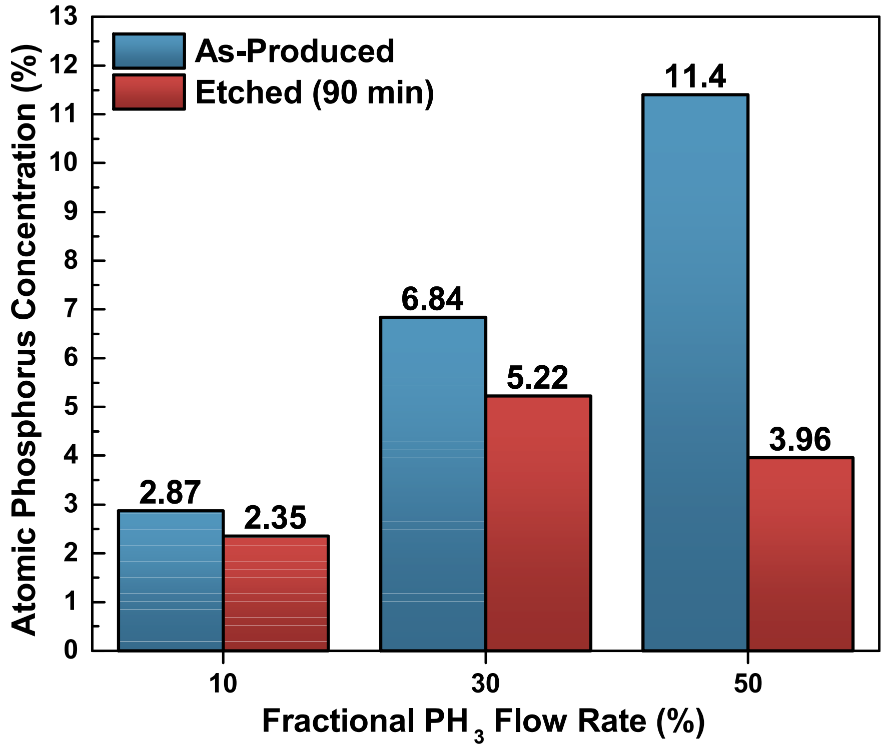

Figure S5: Atomic phosphorus concentration for as-produced and HF etched phosphorus-doped silicon nanocrystals obtained via Energy-dispersive X-Ray Spectroscopy.

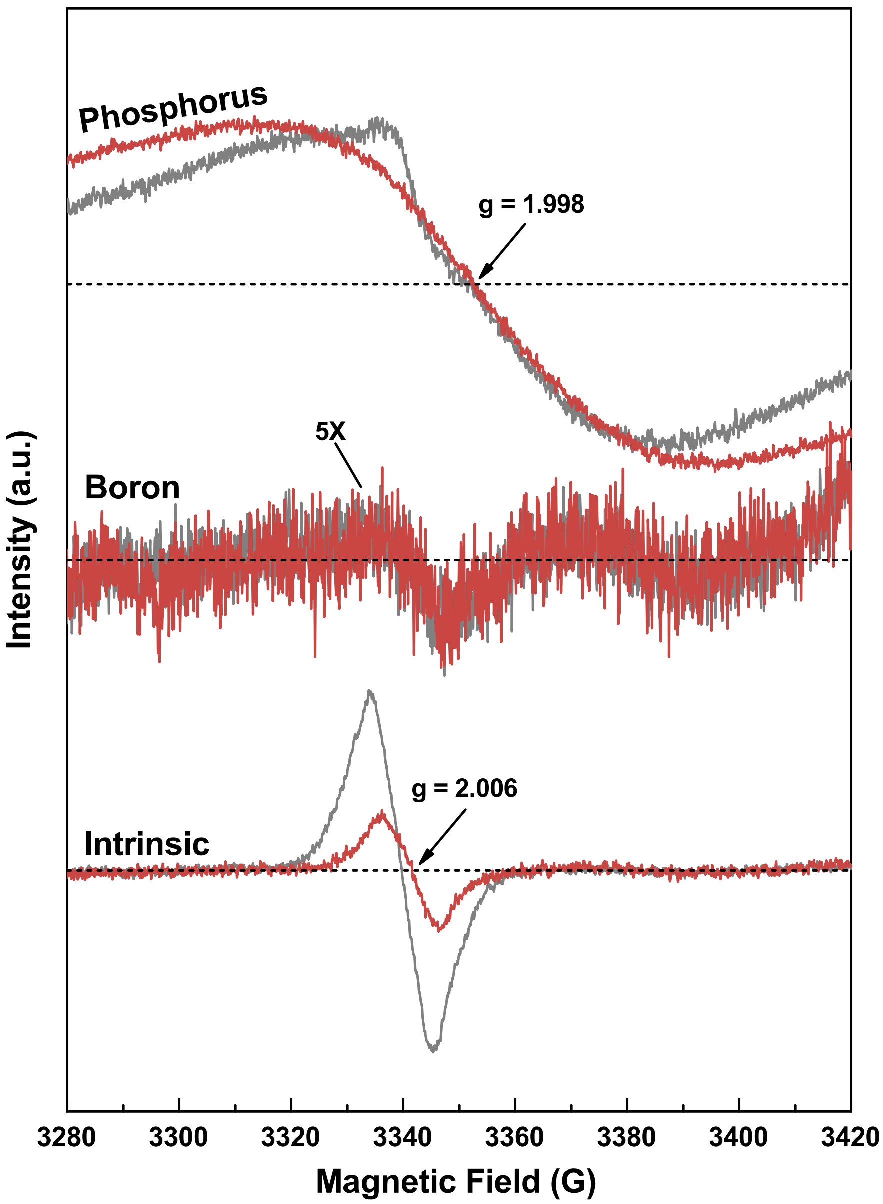

Figure S6: Electron Paramagnetic Resonance (EPR) spectra for as-produced (gray) and annealed (red) Si NCs. A reduction in signal is observed for annealed intrinsic NCs as a result of surface restructuring and defect reduction. A feature is also removed from the phosphorus-doped spectrum, likely caused by a similar reduction in defects. The boron-doped spectrum does not change significantly after annealing.

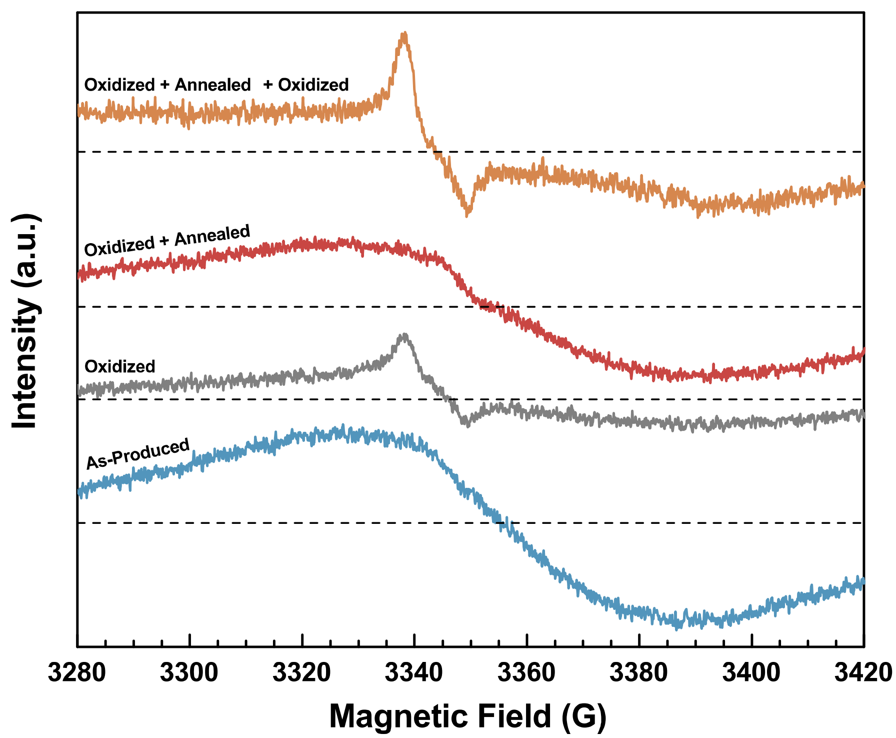

Figure S7: Electron Paramagnetic Resonance (EPR) spectra for as-produced and post-synthesis treated phosphorus-doped Si NCs. As-produced (blue) NCs exhibit a broad absorption as a result of free conduction electrons. After oxidation (gray) the spectrum changes due to the formation of an oxide shell, giving rise to P_b defects. A subsequent annealing treatment (red) reduces the number of defects and a broad absorption returns which resembles the spectrum of as-produced NCs. This can be reversed again by reoxidation (orange) of the NCs.