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Optical Trapping in Silicon-Based Photonic Crystal Microcavities[1] SEYED HAMED MIRSADEGHI, JEFF F. YOUNG, University of British Columbia — A Si-based photonic integrated circuit has been designed to optically trap gold nano-particles at precise, lithographically defined positions on a silicon wafer. The circuit consists of input/output grating couplers, waveguides and a photonic crystal resonant cavity, all designed to operate at wavelengths near 1.5 microns. The objective is to use this as a means of bringing together metal and semiconductor (tethered to the metal) nanoparticles with plasmonic and excitonic resonances coincident with the microcavity resonance, for cavity quantum electrodynamic experiments and applications. The optical trapping potential achievable at the main antinode of the resonant cavity was calculated using 3D FDTD simulations, assuming 10 mW of CW optical power is available to excite the input grating coupler. These calculations suggest that the optical trap depth is 40 kT at room temperature, for a 30 nm diameter gold sphere. Experimental characterization of test samples fabricated based on this design agrees well with simulations.

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