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A Silicon MEMS Probe Integrated with Light Emitting Nanoparticles on Tip for Near-field Scanning Optical Microscopy[1] X. ZHANG, K. HOSHINO, L. ROZANSKI, D. VANDEN BOUT, The University of Texas at Austin — We have built a nanoscale light emitting diode (LED) on a silicon MEMS probe for near-field scanning optical microsopy (NSOM). The LED was made of semiconductor nanoparticles electrostatically trapped between a pair of silicon electrodes located on the tip. The probe was microfabricated on a Silicon-on-Insulator (SOI) wafer. The facing electrodes were made by cutting a lithographically patterned device layer using a focused ion beam (FIB). When the voltage was applied, the nanoparticles were polarized and attracted to the gap along the electric field gradient. Basic parameters of a nanoparticle-trapped LED were measured. The probe was attached to a tuning fork and mechanically oscillated. The resonant frequency of the tuning fork was originally about 100KHz and was dampened to 93.0KHz with the probe attached. As the tip approaches the surface of the sample, a drag force acting on the tip changes the oscillating amplitude; measured as a voltage signal from the fork, which in feedback allows the tip to be positioned in the near-field, roughly 5-10nm from the surface. Successful fabrication of the light emitting NSOM probe leads to integrated "light-source free" optical scanning arrays suitable for novel applications in nanomaterial characterization and biology.

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