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Super-resolution imaging using fluorescent soft micro-lens KEXIN JIAO, PUNIT KOHLI, Department of Chemistry and Biochemistry, Southern Illinois University Carbondale, ANNIE LU, SRINIVASA RAGHAVAN, Department of Chemical & Biomolecular Engineering, University of Maryland, PUNIT KOHLI TEAM, SRINIVASA R. RAGHAVAN COLLABORATION — Spatial resolution of conventional optical microscope is limited by the diffraction of roughly half the wavelength of the incident light. Among strategies of obtaining resolution beyond the diffraction limit, near-field scanning optical microscopy (NSOM) is widely used. In previous work, we performed NSOM using a simple design constituted by attaching a glass micro-lens (MLs) or a liquid MLs on a cantilever. However, NSOM achieves super-high resolution sacrificing its mobility and imaging speed comparing with far-field imaging, especially when the specimen has uneven surfaces. In this work, we showed that a polydimethylsiloxane (PDMS) micron-sized sphere can be used as MLs as well. Images having enhanced contrast resolutions were achieved when the PDMS MLs was mechanically deformed along z-axis. On the other hand, the focal length of PDMS MLs can be tuned when being deformed by the pressure along x-axis. The scanning mobility of the whole device was further improved when attaching PDMS MLs onto a flexible cantilever. We also introduced different fluorophores into PDMS spheres, which resulting fluorescent MLs (FMLs). The advantages of FMLs involve the feasibility of locating MLs during a fluorescent imaging while having tunable focal length.

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