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Single-Molecule Microscopy System for Tunable Nanoscale Confinement

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We present the design and construction of a versatile, open-frame inverted microscope system for wide-field fluorescence and single molecule imaging. The microscope chassis and modular design allow for customization, expansion, and experimental flexibility. We present two components that are included with the microscope which extend its basic capabilities and together create a powerful microscopy system. The first is a piezoelectric controlled Convex Lens-induced Confinement (CLiC) device that provides the system with single-molecule imaging capabilities, and the ability to manipulate molecules at the nanoscale. The CLiC device creates a precise sample-chamber gap that can be adjusted during an experiment to confine molecules or align them within embedded nanostructures. Additionally, a two-color imaging system provides the option of imaging multiple molecular species simultaneously. The flexibility of this microscopy system with its open-framed chassis combined with accessible single-molecule, multi-species imaging technology supports a wide range of new measurements in the health, nanotechnology and materials science research sectors.

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