Microlenses for monitoring pathogens on surfaces by exploiting fluorescence microscopy with a smartphone

When dealing with pathogens the length scale of targets may vary over more than 2 orders of magnitude moving from virus (about 10 nm) to bacteria (about 1 um), and over. Usually high resolution/magnification electron and confocal microscopes are used to image and investigate pathogens, though they are cumbersome, expensive, and need trained personnel.

In this talk, we describe the moldless preparation of 3D and 4D silicone lens encoding photonic or plasmonic optical filter for mobile-phone optical/florescence microscopy. The fabrication process of the silicone lens shows high reliability (yield >95%), low-cost (0.01 $), and good flexibility for a wide range of applications. As a proof-of-concept application, using a single monolithic lens/filter element self-adhered to a commercial smartphone camera, we demonstrate: the fluorescence imaging and counting of live/dead isolated human cancer cells with high magnification and rejection of the excitation light; the fluorescence imaging and counting of living microbes in water, namely, the auto-fluorescent green alga *Chlorogonium* sp. and the ciliated protozoan *Euplotes daidaleos*.

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