THE UNIVERSITY OF TOLEDO
1872

CHEMISTRY AND BIOCHEMISTRY COLLOQUIUM

Tiny Lenses with Superior Images

Abstract. Recently, intensive efforts have been made to achieve optical imaging resolution below 200 nm. The negative index super-lens, the hyper-lens, the super-oscillation lens and other super-resolution approaches have been proposed to overcome the diffraction limit. Apart from the excellent performance, these techniques face challenges of unavoidable losses or extreme fabrication finesse. Furthermore, some of them utilize near-field microscope, or working only with the objects manufactured on the lens, or have a special illumination conditions for obtaining super-resolved images. We have developed a new super-resolution microscope for optical imaging which have achieved a resolution <100 nm using a broad-band white light source. The noninvasive microscope uses self-assembled plano-convex microlens (ML) to collect diffractive light from specimen. The lenses possess an atomic smooth surface and the high refractive index. The produced super-resolution images are magnified by a conventional microscope without use of further computation facilities. We demonstrate that the microscope provides superior fluorescence images where a resolution of ~90 nm and ~ 4 enhanced emission intensity was obtained. This microlens based microscope is easy to fabricate and use, inexpensive, and do not require special requirement for illumination (brightfield, dark field, and fluorescence modes can be used). It has potential applications in diverse fields of life-, bio-, and materials- sciences.

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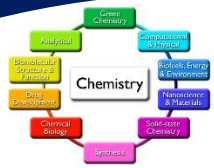

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