

Confocal microscope scrutinizes diamond microlens arrays

Just as diamonds are rare in nature, optical elements made of single-crystal diamond are rare in the optical world. Although diamond's durability, high (in fact, unmatched) hardness and thermal conductivity, high index of refraction, lack of birefringence, and large spectral-transmission window would make the material a gem in the optical designer's toolkit, diamond's high cost and difficulty to shape has for the most part relegated its use to the occasional small window or other element for harsh environments.

Now, scientists at the University of Strathclyde (Glasgow, Scotland) are fabricating microlens arrays from Type-IIa natural single-crystal diamond (type IIa has the highest thermal conductivity). Using photoresist reflow and inductively coupled plasma etching arrays with 18- μm -diameter, 1.5- μm -high lenses on an approximately 25- μm pitch were fabricated with a root-mean-square surface roughness of 1.2 nm. The researchers used a laser scanning reflection/transmission confocal microscope to measure focal length (21 μm), spot size (1.4 μm), and surface profile of the microlenses, providing 3-D images of the optical field to high resolution. The microlens arrays could be integrated with gallium nitride-based photonic devices. *Contact Erdan Gu at erdan.g@strath.ac.uk.*