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Subwavelength all-dielectric disk laser is mass-manufacturable

A subwavelength all-dielectric microdisk laser developed at Yale University (New Haven, CT), Northwestern University (Evanston, IL), and the National Institute of Standards and Technology (Gaithersburg, MD) can be fabricated using standard photolithographic techniques, making it suitable for mass production. Previous subwavelength-size disk lasers required electron-beam lithography and dry etching, a much more expensive approach. Subwavelength laser sources are potentially useful for pinpoint-accuracy biological sensing, as well as in optical integrated circuits.

The new lasers, which are aluminum gallium arsenide (AlGaAs)-based, can have an azimuthal mode number (number of wavelengths that fit the circumference) of either 4 or 5; the modes are more widely spaced in wavelength than the width of the gain spectrum, necessitating fine-tuning of the disk diameter for laser output. The laser (which must be cooled to 10 K for the experiment) consists of a GaAs disk sitting on top of an AlGaAs pedestal, and is pumped with a mode-locked 800 nm Ti-sapphire laser. In one example, the laser has a diameter of 627 nm, a thickness of 265 nm, and an emission wavelength of 870 nm. The modal volume is only 0.97 $(\lambda/n)^3$. *Contact Hui Cao* at hui.cao@yale.edu.
