Articles

Tiny Powder Laser Sources Could Have Many Commercial Uses

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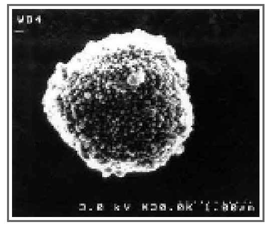
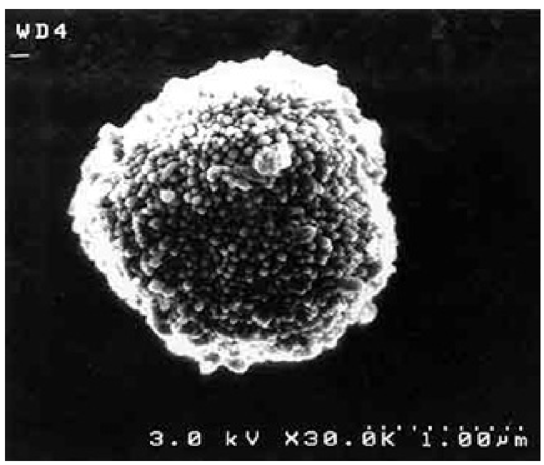


It may be possible to make micron-size lasers from chemicals, solvents, a hot plate and glass beakers, without the need for huge nano-fabrication facilities. That's the implication of a report from researchers at Northwestern University (Evanston, IL). In the May 22 issue of *Applied Physics Letters,* they describe a laser-emitting powder particles only one micron in diameter. The powders do not require the slow and expensive fabrication processes typical of the semiconductor lasers used in the LEDs of electronic devices.

The tiny powder lasers, reported by physicist Hui Cao and her colleagues at Northwestern, are unusual in that they have a highly disordered structure. That contrasts sharply with traditional semiconductor lasers, which have well-defined cavities and perfectly ordered structures to minimize light scattering. In those devices, normal light scattering reduces laser output. The researchers have been able to show that this disorder paradoxically enhances the lasing effect. In a totally disordered medium, they explain, scattering is very strong, and it actually helps lasing because it forms closed-loop paths for the light and creates feedback. In effect, they point out, it makes its own laser cavities.



Scanning electron microscope photo of a micron-sized zinc selenide particle used in a powder laser. (Source: Northwestern University)

Last year, the Northwestern team found that when they pumped disordered zinc oxide powders with a conventional laser at low power, the materials gave off light with a broad band of wavelengths. But as the pump power was increased, the bands sharpened, and above a certain threshold, very sharp frequency bands appeared. The narrow frequency range of those bands and their strong polarization confirmed that the light was in fact a laser emission. Now they have shrunk the size of the powder lasers down to particles of zinc selenide that are one micron in size. The lasing wavelength is 380 nm and the devices operate at room temperature.

What is promising about the very small lasing powders is that, if they can be mass produced, they would be cheaper and more efficient than the LEDs now used as laser sources in cell phones, calculators and other devices with luminescent displays. In fact, Cao has stated that the zinc oxide powders have the potential to be 1,000 times brighter than an LED while consuming the same amount of powder.

For more information, contact Hui Cao of Northwestern University at 847-467-5452.

Edited by Gordon Graff