NEWS

Levitated dye droplets show lasing action

16 June 2006

Researchers from Sweden and Denmark have developed a method of lasing from levitated liquid droplets containing laser dye. The technique could be used to probe sensitive biomolecules, and in the future for high-throughput biochemical analysis.

The researchers, from the Technical University of Denmark, Lund University in Sweden, and Astra Zeneca's R&D Centre in Mölndal, Sweden, claim that this is the first observation of reproducible lasing from levitated droplets. The experiment creates the prospect of using lasing action to probe minute biological or chemical changes inside liquid droplets.

"We see opportunities in making biochemical analysis of sensitive biomolecules like membrane proteins that do not tolerate container walls well, single cells, and perhaps even single molecules," Anders Kristensen, one of the researchers, told optics.org. "Since the droplet is trapped, a biological or chemical system can be analyzed for extended time periods, without interference from container sidewalls."

In the experiment, the researchers optically pumped an ultrasonically levitated liquid droplet containing a laser dye, Rhodamine 6G, to produce laser action over the 610-650 nm wavelength range (*Optics Express* **14** (10) 4374-4379). The droplets were pumped with a pulsed 532 nm frequency-doubled Nd:YAG laser with a pulse length of 5 ns and repetition rate of 10 Hz. Each droplet was pumped at most with 100 pulses, corresponding to a duration of 10 seconds, before being replaced by the next droplet.

Lasing action from levitated laser droplets

"The droplet is formed by shooting a number of picolitre droplets into the ultrasonic trap - the small droplets are formed by computer controlled piezoelectric micro-dispensers," said Kristensen. The team says that combining the levitated droplet detector with the computer generated on-demand droplets offers the potential for high-throughput biochemical analysis.

According to the team, the aim now is to better understand the relationship between lasing and the properties of the droplet. "After having demonstrated the working principle, further development should lie in correlating the optical output spectrum with the droplet shape and internal absorption. Once this is done the technique can be used to probe for very small changes in optical properties of the droplet constituents," concluded Kristensen.

About the author

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