Departamento de Física de Materiales

Semiconductor random laser manufactured by pulsed laser ablation

Ceferino López

Instituto de Ciencia de Materiales de Madrid – ICMM (CSIC), Madrid

MIÉRCOLES 10 DE ABRIL A LAS 12:00

SALA DE GRADOS, FACULTAD DE CIENCIAS FÍSICAS, UCM

Random lasers hold promise in applications as disparate as light sources for imaging or complex network engineering. They can be obtained by combining the various ways in which the required amplification and feedback can be coupled. The former is provided by an active material (e.g. a semiconductor); the latter by a suitable refractive index arrangement (e.g a Fabry-Perot cavity) and both are used in commercial laser diode technology.

Introducing scattering defects in the active layer to produce semiconductor random lasers adds complexity to the fabrication process and robs them of the edge potentially offered by disordered structures. The ready availability of electrically pumped random lasers, avoiding a costly fabrication approach, would boost the use of these devices in research and applications.

Here we'll show how incoherent semiconductor random lasers can be obtained by simply processing the output mirror of an off-the-shelf Fabry–Pérot laser diode via controlled laser ablation. Optical feedback provided by the intact back mirror and the ablated output coupling mirror results in multimode random lasing with low spatial coherence and disordered angular patterns.

In order to better understand their operation, and improve their performance, surgical modification of the output mirror is desired. Techniques such as focused ion beam lithography have this potential.