

Fabrication of Multilayered Structure for Coherent Random Lasing

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High powered lasers have many applications, including medical treatment and surgery. However, these lasers are extremely expensive and are therefore not widely available. The aim of this study was to demonstrate a method to create such a laser with significantly decreased overall cost and increased efficiency. In order to do this, we explored a phenomenon called random lasing which is a light amplification process. To start with, a low-cost pumping laser is directed at normal incidence toward a multi-layered sample with two alternating layers. At first pearl, a naturally found material that has many organic nano-scale layers (similar to the wavelength of visible light) was utilized and later fabricated using a spin coating technique. For the fabrication, two polymers, SU-8 with Rhodamine 6G (a fluorescent laser dye) and PMMA, were tested at different concentrations and spin coating speeds. It was necessary dissolve both polymers in a solvent so toluene composed about 25% of each solution. The spin coating speeds ranged from 1500 to 3000 rpm for both polymers to achieve layers approximately 500 nm thick. After the fabrication process, the pumping laser was directed at normal incidence onto the sample which increased the noise level and subsequently increased the degree of light localization. Light localization increases the amplification of the pumping laser and non-uniformity of the alternating layers increases this effect. Therefore, the lasing threshold was decreased which increases the lasers efficiency.