Electro-tunable laser action in dye-doped sol-gel waveguide under holographic excitation

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Waveguide dye lasers with distributed feedback (DBF) generate short pulses with narrow linewidth and thus are attractive compact coherent light sources which find applications in many areas of photonic technology. We repot in this work our experimental results on the electrically switching laser emission by using a dye-doped sol-gel silica waveguide as an active medium by a transient grating that used interference fringes induced by two excitation laser beams (holographic excitation). The dye-doped sol-gel silica samples of high optical homogeneity used in our experiments were fabricated following the sol-gel process described in [2]. The wavelength of laser emission λ_{Bragg} on holographic excitation can be express by the following equation:

$$\lambda_{Bragg} = \frac{n_{eff}\lambda_{ex}}{m\sin\theta}$$

where n_{eff} is the effective refractive index of the active medium, λ_{ex} is the wavelength of excitation beams, m is the order of diffraction and θ is a half angle between two excitation beams. A tunability of the laser-emission wavelength could be realized by changing of the angle between two excitation beams 2θ. In our case, the switching of lasing wavelength was realized by changing angle θ with the help of twist nematic cell and the biaxial material prism. A second harmonic light of a Q-switched Nd:YAG laser was used for excitation. The excitation laser beams were focused into a stripe by use of cylindrical lens.

References

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