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Experimental conditions for the coupling of random lasing and stimulated Raman scattering of dyes

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The random lasing (RL) in the multiple scattering active media can occur together with the stimulated Raman scattering (SRS) and form a quasilinear secondary emission spectrum under conditions of the diffuse light propagation. Under these conditions, the stimulated Raman scattering spectrum obtained from the secondary emission spectrum is a more structural than the spontaneous Raman spectrum. This makes it possible to detect even weak and close located spectral Stokes lines in principle.
We were experimentally investigated the features and experimental conditions for the coupling course of these processes in the multiply scattering media based on the vesicular polymeric films dyed with laser dyes. The intensity of these lines nonlinearly depends on the pump intensity and is proportional to the random lasing intensity at the corresponding frequency and observed only within the random lasing area. The width of the secondary emission spectrum and the SRS lines number which show in it are increase with increasing dye concentration and vesicle concentration. The relative intensity of the SRS lines and RL intensity increase with decreasing temperature to the helium levels, which leads to an increase in the sharpness of the quasilinear spectrum of secondary emission. The SRS lines are show only in the overlap regions of the random lasing spectrum with the Stokes lines location spectral range, which can be established using the pseudo-Stokes spectrum constructed using the infrared absorption spectrum of dye. The SRS occur at all Raman frequencies which find oneself in the RL spectrum range.

Topics

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