MEDIUM WAVE BLEACHING AND HIGH-EFFICIENT GENERATION OF RADIATION UNDER STIMULATED RAMAN SCATTERING BY POLARITONS

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S u m m a r y

A quasistationary theory of stimulated Raman scattering by polaritons in liquids and solids is developed taking into account all possible three- and four-photon parametric processes, alteration of resonant-state populations and the phenomenon of substance wave bleaching (WB). Processes of phase capture (PC) on the nonlinear medium edge leading to a significant simplification of the amplitude equations are considered. It is shown that WB may be established under initial PC and second PC when a laser pump is totally exhausted. The critical value of the generalized dipole momentum D of a vibrational transition is found under which the transition from one WB regime to the other occurs. The motion integrals for the systems of differential equations are obtained that allow one to find the analytical dependences of wave amplitudes under WB on D as well as the quantum coefficients of radiation transformation. The existence of optimal values of the pump amplitude and D is established when the maximal efficiency of polariton radiation is achieved. It is shown that, under the generation of two Stokes components, the quantum efficiency of polariton generation reaches 90% what is twice as many as under Stokes – anti-Stokes scattering. The total efficiency of Stokes and polariton generations exceeds 180%.