Ultrafast photoinduced shift of cavity modes in semiconductor microcavity under femtosecond excitations

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Ultrafast photoinduced changes of reflection spectra on the frequencies of interference (cavity) modes in semiconductor films on metal substrates (the Schottky barrier structures based on ZnS, ZnSe films on Ni, Cr and Cu substrate) were investigated by femtosecond pump-supercontinuum probe spectroscopy in wide spectral region 1.6 - 3.2 eV.

For the pumping energy below the energy gap of semiconductor the laser pulse excites mainly electrons of a metal (i.e. the boundary of the microcavity). Nonequilibrium carriers of the metal penetrate through the Schottky electron barrier into the semiconductor and change the dielectric function of the semiconductor microcavity and the boundary conditions forming instant electric dipoles on the boundary. Photoinduced changes in optical thickness of the microcavity and in the boundary condition lead to observable in femtosecond time scale shifts of cavity modes [1-4]. The time for such changes is less than the time for establishment of the Fabry-Perot cavity modes.

References

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