EFFECTS OF BIREFRINGENCE AND POLARIZATION DEPENDENT LOSSES IN CAVITY RING-DOWN SPECTROSCOPY

HAIFENG HUANG, KEVIN K. LEHMANN, *Department of Chemistry, University of Virginia, Charlottesville VA, 22904-4319*.

In cavity ring-down spectroscopy (CRDS), residual or stress induced birefringence of supermirrors will lift the polarization degeneracy of TEM_{00} mode between x and y directions and generate two new polarization states in the cavity with small resonant frequency splitting (~ 0.1 KHz). These two modes are elliptically polarized but very close to linear polarization and perpendicular with each other. When both modes are excited simultaneously, the ring-down signal is no longer single exponential decay becuase of mode beating effect. With two high extinction ratio polarizers, one in front of the cavity and the other behind the cavity, one can selectively excite and detect only one of these two modes and improve the ring-down signal. Polarization dependent losses of supermirrors make the decay time constant depend on the orientation of linear polarization of the incident light. With Jones matrix calculus, the authors can explain the experimental results. Phase retardance from birefringence of both mirrors can be calculated to be $\sim 10^{-6}$ rad or $\sim 10^{-7}$ rad, depending on if the cavity is under cavuum or low stress conditions.