Density influence on the atomic spin randomization

S. Tsvetkov[1], S. Gateva[1], S. Cartaleva[1]

[1]Institute of Electronics, Bulg. Acad. of Sc., 72 Tzarigradsko Chaussee blvd., 1784 Sofia, Bulgaria

Antirelaxation coatings (ARC) are organic films used in optical cells containing alkali metal vapor, which reduce the depolarization of alkali atoms after collisions with the cell's walls. The antirelaxation properties of the coatings are characterized by the number of collisions of an atom with the walls without spin randomization. The long-lived ground state polarization is a basis for development of atomic clocks, magnetometers, quantum memory, slow light experiments, and precision measurements of fundamental symmetries. Light-Induced Atomic Desorption (LIAD) is a non-thermal process in which atoms adsorbed at a surface are released under illumination. It is applied mostly to implementing optical dispensers in the cases when high atomic density at low temperature is needed – for example, for loading atomic devices as atomic magnetometers, atomic clocks, magneto-optical traps and their miniaturization. In this work the influence of the Rb atomic density on the spin depolarization (the number of collisions without spin depolarization) in PDMS coated vacuum cell is investigated when the density is controlled by temperature or by LIAD. A simple method for measurement of the number of collisions without spin-depolarization is used, which comprises recording of the time dependence of the fluorescence intensity of alkali atoms during exposure of the cell to resonant radiation pulses [1]. The results obtained are discussed in the light of the previous investigations of atomic spin randomization relaxation and possible LIAD applications in coherent spectroscopy [2-4].

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