Light induced atomic description from siloxane surfaces: general features and applications as loading technique for a vapor coated cell MOT

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The light induced atomic desorption effect, named LIAD, is observed in Pyrex cells coated with siloxane films, namely the polydimethilsiloxane (PDMS) and octamethylcyclotetrasiloxane (OCT), and consists of a huge emission of alkali atoms photodesorbed from the coating where they have been collected by physisorption. Liad is a non-thermal phenomenon and it can be observed even with very weak light intensity. It shows a frequency threshold analogous to the work function of the photoelectric effect in metals and similarly an increasing efficiency with increasing light frequency.

We have studied theoretically and experimentally the influence of light on the diffusion and we have demonstrated that non resonant light increases both the mobility of atoms inside the bulk coating and the desorption rate. These interesting features characterize a new class of photo-induced phenomena whose analysis gives new insight in the knowledge of atom-dielectric interactions and to important practical applications: as the optimization of trapping efficiency in the case of very weak atomic flux or extremely low vapor density or as the realization of atomic sources controlled by light at room temperature.

We demonstrate the possibility of loading a conventional vapor magneto-optical trap (MOT) using the light induced desorption of Rubidium atoms from the cell walls coated by PDMS film. The atoms were preliminary stored in the coating by physisorption and then desorbed by a flashlight. It was found that after flash it takes about 40 ms to load Rb atoms from photodesorbed vapor to the trap, after loading the cold atoms remain in the trap for half a minute or more. This technique is promising in the case of weak traps where the previous accumulation and low loss of desorbed atoms can lead to an improvement in collection and trapping processes. Further development and study are in progress to maximize the increase in the number of trapped atoms and to understand better the properties of desorbed atoms and the load mechanism when different kinds of alkali-atoms are present. We also present the preliminary results about the Liad effect with Lithium atoms.