APPLICATION OF THE MAGNETIC FIELD EFFECTS IN THE GASEOUS FLUORESCENCE AND PHOTOCHEMISTRY TO INVESTIGATION OF THE PHOTOLYSIS MECHANISMS

VLADIMIR I. MAKAROV, *Institute of Chemical Kinetics and Combustion SB RAS, 630090, Novosibirsk, Russia*; SERGEI A. KOCHUBEI, VALERII N. ISCHENKO, *Institute of Semiconductor Physics, SB RAS, 630090, Novosibirsk, Russia*.

Since the earlier work of Solarz, Batler and Levy in 1973 on NO_2 and Matsuzaki and Nagakura in 1974 on CS_2, external magnetic field effects on gaseous fluorescence have been found for a number of molecules such as SO_2, carbonyls, diazines and triazine. In the present study, we have investigated the magnetic field effects in the NO_2, SO_2, and (COF)2 (000-band fluorescence of the $\tilde{A}^1Au \leftarrow \tilde{X}^1Ag$ transition) fluorescence and in the NO_2 and CS_2 photolysis under the time resolved experiments. It was found that in the presence of a magnetic field, the fast component induced by a magnetic field appears in the NO_2 and SO_2 fluorescence. Lifetime and amplitude of this component are dependent of a magnetic field (B). The observed data were explained by DM, in a frames of which, we assume that the $\langle {}^2B_2 \,|H_z\, |{}^2A_1\rangle$ (= VB) and $\langle {}^2B_1 \,|H_z\, |{}^2A_1\rangle$ (=VB) coupling are significant for NO_2, and ($\langle {}^1A_2 \,|H_z\, |{}^1A_1\rangle$+($\langle {}^1B_1 \,|H_z\, |{}^1A_1\rangle$ (= VB = bB) coupling is significant for SO_2. Here, Hz is the Zeeman operator. It has also been found that the magnetic field reduces the yield of the NO_3 radical and S_2 molecules under the NO_2 and CS_2 photolysis. From analysis of these data it has been defined the effective reactivity of the different excited states of the studied systems. It was found that the fast component of the 00-level fluorescence decay of the $\tilde{A}^1Au \leftarrow \tilde{X}^1Ag$ transition appears in the presence of a magnetic field. Lifetime of this component is not dependent of B, while it amplitude increases with increasing of B. Lifetime of the slow component increases in the presence of a magnetic field at P((COF)2) = 0.3 mTorr, while it decreases under other pressures. Obtained data were explained by IM, ie, magnetic field induces coupling of the hyperfine and fine sublevels of the neighbouring triplet state, which are coupled by the intramolecular interactions with the fluorescent singlet levels. Since in this case, a magnetic field influences on the efficiency of the S-T coversion, using of this method we can study the role of such energy transformation in the (COF)2 molecule photolysis.