STUDIES ON THE PHOTO-DISSOCIATION AND SYMMETRY OF THE $\widetilde{D}$ STATE OF $SO_2^+$

ZHONG WANG[a], LIMIN ZHANG, SHILIN LIU, SHUQIN YU, AND XINGXIAO MA, *Laboratory of Bond Selective Chemistry, Department of Chemical Physics, University of Science and Technology of China,People's Republic of China*.

Pure parent ions, $SO_2^+$ $\tilde{X}^2A_1(000)$, were prepared by [3+1] multiphoton ionization of $SO_2$ molecules at 380.85 nm. The photodissociation process and the symmetry of the excited states of $SO_2^+$ molecular ions was investigated by measuring the photofragment $SO^+$ excitation (PHOFEX) spectrum in ultra-violet (UV) (282-332 nm) and the visible (562-660 nm) wavelength ranges, respectively. The $\widetilde{D}(v_100), \widetilde{D}(0v_20) \leftarrow \widetilde{X}^2A_1(000)$ transitions of $SO_2^+$ were assigned in the PHOFEX spectrum in the UV range. By comparing the resolved PHOFEX spectrum in UV range to the continuous PHOFEX spectrum in visible range, it is deduced that around the $\widetilde{D}$ state of $SO_2^+$ there exists a repulsive state ($\alpha^2A_2$) converging to the dissociation limit of $SO^+(X^2\pi) + O(^3P_g)$, and the coupling between $SO_2^+$ $\widetilde{D}$ and $SO_2^+(\alpha^2A_2)$ leads to the dissociation to $SO^+(X^2\pi) + O(^3P_g)$. The symmetry of the $\widetilde{D}$ state is $\widetilde{D}^2B_1$.

[a]Present Address: Department of Chemistry, Brookhaven National Laboratory, Upton, NY 11973-5000