Infrared multiphoton excitation and dissociation studies of SO_2

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Summary. — Infrared multiphoton absorption of 9R(26) and 9R(32) CO_2 laser lines by SO_2 molecule was studied for the unfocused laser energies of 100 mJ to 253 mJ. Dispersed fluorescence spectra extending from 3200 Å to 4500 Å confirmed the very strong coupling between the ground and excited electronic states of SO_2. The shapes of the spectra were completely different for the 9R(26) line or the neighboring 9R(32) line corresponding to the wavelengths 1082.3 cm^{-1} and 1085.8 cm^{-1}, respectively, and for different laser energies. This indicates that the infrared multiphoton excitation process is controlled both by the laser intensity and the wavelength. The formation of sulfur from possible dissociation or fragmentation of SO_2 molecules was monitored using glass substrates suspended inside the absorption cell. Proton-Induced X-ray Emission (PIXE) measurements of these substrates show the presence of sulfur only for the 9R(32) laser line and energy of 253 mJ, providing evidence of fragmentation of SO_2 under these conditions.

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