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Laboratory Studies of O_2 Excited States Relevant to the CO_2 Planets: The O_2 *c-a* Emission in the Nightglow of Venus

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Knowledge of the details relevant to the production of excited O_2 is critical for the study and modeling of composition, energy transfer, airglow, and transport dynamics in CO_2 planetary atmospheres. Significant gaps and uncertainties exist in our understanding of the above processes, and often the relevant input from laboratory measurements is missing or outdated.

We are performing laser-based laboratory experiments to investigate the O-atom three-body recombination responsible for the generation of oxygen airglow in the upper atmosphere of Venus and Mars. In the laboratory, an ultraviolet light pulse from a laser photoinitiates O-atom recombination in a CO_2 environment. Spectroscopic techniques are used to probe the excited O_2 molecules produced following recombination and subsequent relaxation in CO_2. Our recent results indicate that the O_2 *c-a* emission is strongly enhanced by collisions with CO_2 and can even exceed the O_2 *c-X* Herzberg II emission intensity at sufficiently high CO_2 pressures.

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