

## COLLISION-INDUCED INFRARED ABSORPTION BY COLLISIONAL COMPLEXES IN DENSE HYDROGEN-HELIUM GAS MIXTURES AT THOUSANDS OF KELVIN

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The interaction-induced absorption by collisional pairs of H<sub>2</sub> molecules is an important opacity source in the atmospheres of the outer planets and cool stars <sup>a</sup>. The emission spectra of cool white dwarf stars differ significantly in the infrared from the expected blackbody spectra of their cores, which is largely due to absorption by collisional H<sub>2</sub>-H<sub>2</sub>, H<sub>2</sub>-He, and H<sub>2</sub>-H complexes in the stellar atmospheres. Using quantum-chemical methods we compute the atmospheric absorption from hundreds to thousands of kelvin <sup>b</sup>. Laboratory measurements of interaction-induced absorption spectra by H<sub>2</sub> pairs exist only at room temperature and below. We show that our results reproduce these measurements closely <sup>c</sup>, so that our computational data permit reliable modeling of stellar atmosphere opacities even for the higher temperatures <sup>d</sup>.

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<sup>a</sup>L. Frommhold, *Collision-Induced Absorption in Gases*, Cambridge University Press, Cambridge, New York, 1993 and 2006

<sup>b</sup>Xiaoping Li, Katharine L. C. Hunt, Fei Wang, Martin Abel, and Lothar Frommhold, *Collision-Induced Infrared Absorption by Molecular Hydrogen Pairs at Thousands of Kelvin*, *International Journal of Spectroscopy*, vol. 2010, Article ID 371201, 11 pages, 2010. doi: 10.1155/2010/371201

<sup>c</sup>M. Abel, L. Frommhold, X. Li, and K. L. C. Hunt, *Collision-induced absorption by H<sub>2</sub> pairs: From hundreds to thousands of Kelvin*, *J. Phys. Chem. A*, published online, DOI: 10.1021/jp109441f

<sup>d</sup>L. Frommhold, M. Abel, F. Wang, M. Gustafsson, X. Li, and K. L. C. Hunt, "Infrared atmospheric emission and absorption by simple molecular complexes, from first principles", *Mol. Phys.* 108, 2265, 2010