The interaction-induced absorption by collisional pairs of H\(_2\) molecules is an important opacity source in the atmospheres of the outer planets and cool stars \(^a\). 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\(_2\)–H\(_2\), H\(_2\)–He, and H\(_2\)–H complexes in the stellar atmospheres. Using quantum-chemical methods we compute the atmospheric absorption from hundreds to thousands of kelvin \(^b\). Laboratory measurements of interaction-induced absorption spectra by H\(_2\) pairs exist only at room temperature and below. We show that our results reproduce these measurements closely \(^c\), so that our computational data permit reliable modeling of stellar atmosphere opacities even for the higher temperatures \(^d\).

\(^a\)L. Frommhold, Collision-Induced Absorption in Gases, Cambridge University Press, Cambridge, New York, 1993 and 2006
\(^c\)M. Abel, L. Frommhold, X. Li, and K. L. C. Hunt, Collision-induced absorption by H\(_2\) pairs: From hundreds to thousands of Kelvin, J. Phys. Chem. A, published online, DOI: 10.1021/jp109441f