

Abstract Submitted  
for the DAMOP17 Meeting of  
The American Physical Society

**Full-dimensional Quantum Calculations of Rovibrational Transitions in CS induced by H<sub>2</sub>**<sup>1</sup> BENHUI YANG, University of Georgia, PENG ZHANG, Duke University, PHILLIP STANCIL, University of Georgia, J. BOWMAN, Emory University, N. BALAKRISHNAN, University of Nevada, R. FORREY, Penn State University — Carbon monosulfide (CS), the sulfur analogue of carbon monoxide, has been widely observed in a variety of interstellar regions. An accurate prediction of its abundance requires collisional rate coefficients with ambient gases. However, the collisional rate coefficients are largely unknown and primarily rely on theoretical scattering calculations. In interstellar clouds, the dominant collision partner is H<sub>2</sub>. Rate coefficient data on CS-H<sub>2</sub> collisions are limited to pure rotational transitions and no data exist for rovibrational transitions. In this work we evaluate the first full-dimensional potential energy surface for the CS-H<sub>2</sub> system using high-level electronic structure theory and perform explicit quantum close-coupling calculations of rovibrational transitions in CS induced by H<sub>2</sub> collisions. Cross sections and rate coefficients for rotational transitions are compared with previous theoretical results obtained within a rigid-rotor model. For rovibrational transitions, state-to-state rate coefficients are evaluated for several low-lying rotational levels in the first excited vibrational level of CS. Results are presented for both para-H<sub>2</sub> and ortho-H<sub>2</sub> collision partners.

<sup>1</sup>Work at UGA and Emory are supported by NASA grant No. NNX16AF09G, at UNLV by NSF Grant No. PHY-1505557, and at Penn State by NSF Grant No. PHY-1503615.

Phillip Stancil  
University of Georgia

Date submitted: 27 Jan 2017

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