Temperature dependence of the raman shift and raman width of solid parahydrogen: Effect of vibron-phonon scattering

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Abstract: We present a model for vibron-phonon scattering in molecular crystals. A general kinetic equation for the vibrons is derived. We use this equation to calculate the frequency shift and dephasing rate of the vibrons as functions of temperature. We find good agreement between the calculated results and the experimental observations for the Raman shift and Raman width of the fundamental vibrational Raman transition of solid parahydrogen.

Author Keywords: Kinetic equation; Raman shift; Raman width; Temperature dependence; Vibron-phonon scattering

Index Keywords: Hydrogen; Kinetic theory; Molecular vibrations; Numerical methods; Phonons; Thermal effects; Raman shift; Raman width; Solid parahydrogen; Vibron; Molecular crystals

Year: 2003

Source title: Japanese Journal of Applied Physics, Part 1: Regular Papers and Short Notes and Review Papers

Volume: 42

Issue: 6:00 AM

Page : 3483-3489

Cited by: 3

Link: Scorpus Link

Correspondence Address: Kien, F.L.; Department of Applied Phys. and Chem, University of Electro-Communications, 1-5-1 Chofugaoka, Chofu, Tokyo 182-8585, Japan

ISSN: 214922

CODEN: JAPND

Language of Original Document: English

Abbreviated Source Title: Japanese Journal of Applied Physics, Part 1: Regular Papers and Short Notes and Review Papers

Document Type: Article

Source: Scopus

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