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Accession number:12665645
Title:Observation of a rotational transition of trapped and sympathetically cooled molecular ions
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Source title:Physical Review A (Atomic, Molecular, and Optical Physics)
Abbreviated source title:Phys. Rev. A, At. Mol. Opt. Phys. (USA)
Volume:85
Issue:3
Publication date:March 2012
Pages:032519 (7 pp.)
Language:English
ISSN:1050-2947
CODEN:PLRAAN
Document type:Journal article (JA)
Publisher:American Physical Society
Country of publication:USA
Material Identity Number:ER97-2012-003
Abstract:We demonstrate rotational excitation of molecular ions that are sympathetically cooled by laser-cooled atomic ions to a temperature as low as approximately 10 mK. The molecular hydrogen ions HD⁺ and the fundamental rotational transition (v=0,N=0)→(v'=0,N'=1) at 1.3 THz, the most fundamental dipole-allowed rotational transition of any molecule, are used as a test case. This transition has not been observed before. Rotational laser cooling was employed in order to increase the signal, and resonance-enhanced multiphoton dissociation was used as detection method. The black-body-radiation-induced rotational excitation is also observed. The extension of the method to other molecular species is briefly discussed.
Number of references:31
Inspec controlled terms:Doppler broadening - hydrogen ions - laser cooling - multiphoton processes - photodissociation - photoexcitation - positive ions - radiation pressure - resonant states - rotational states - transition moments
Uncontrolled terms:rotational transition observation - trapped molecular ions - sympathetically cooled molecular ions - laser-cooled atomic ions - molecular hydrogen ions - dipole-allowed rotational transition - rotational laser cooling - resonance-enhanced multiphoton dissociation - black-body-radiation-induced rotational excitation - Doppler broadening - HD⁺
Inspec classification codes:A3380P Optical cooling of molecules; trapping - A3380G Diffuse molecular spectra; predissociation, photodissociation - A3520P Molecular rotation, vibration, and vibration-rotation constants - A3380K Multiphoton processes in molecules - A3370C Molecular oscillator and band strengths, transition moments, Franck-Condon factors - A3370J Molecular line and band widths, shapes, and shifts - A3150 Excited states of atoms and molecules
Chemical indexing:HD/el D/el H/el
Treatment:Experimental (EXP)
Discipline:Physics (A)
DOI:10.1103/PhysRevA.85.032519

Database:Inspec
IPC Code:F03H3/00