

FORTHCOMING PAPERS

Phase-Conjugate Amplification Through Transverse Optical Zeeman Pumping in Resonant Doppler-Broadened Degenerate Four-Wave Mixing

C. Schmidt-Iglesias, G. Orriols, F. Pi (Spain)

Degenerate four-wave mixing in an inhomogeneously broadened folded three-level system is considered to analyse theoretically the generation of phase-conjugate signals in optically dense media. The counter-propagating pump waves and the copropagating probe and forward pump waves are taken to be orthogonally polarized and interact selectively with the coupled one-photon transitions such that ground-state Zeeman coherence plays the dominant role in phase-conjugate wave generation. It is shown that even in a purely absorptive resonant interaction, transverse optical pumping gives rise to amplified reflection and coupled-mode oscillation, being the required pump intensities very low compared to that needed for saturation of the optical transitions.

The Translational Energy Distributions for Metal Atoms and Ions Produced via Visible Laser MPD/MPI of Group 13 Metal Alkyls and MPI of Aluminium and Indium Atomic Beams

C. L. Callender, D. M. Rayner, P. A. Hackett (Canada)

The nascent translational energy distributions of group 13 metal ions produced via multiphoton dissociation and multiphoton ionization (MPD/MPI) of their trimethyl derivatives and via multiphoton ionization of metal atomic beams have been measured using time-of-flight mass-spectroscopy. In all cases the ion production was isotropic and the translational energy distribution was approximately Boltzmann. For ionization of free aluminum and indium atoms translational temperatures of 6 K and 4 K were measured, corresponding to most probable velocities of 60 and 24 ms^{-1} . From multiphoton dissociation of trimethylaluminum, trimethylgallium and trimethylindium, translational temperatures of 1800, 700, and 900 K resulted. These correspond to velocities of ~ 1000 , 400, and 350 ms^{-1} . A photodissociation mechanism involving elimination of ethane followed by dissociation of monomethyl metal intermediates to produce metal atoms is in reasonable agreement with the experimental data. The nascent velocities of metal atoms and ions from the metal alkyl and metal beam sources are used to assess the potential of these sources for microfabrication of metal structures.

Study of Processes of Translational Rotational and Vibrational Relaxation Based on CARS Spectra Line Shapes

D. N. Kozlov, V. V. Smirnov, S. Yu. Volkov (USSR)

This paper reviews the various physico-chemical processes responsible for actual linewidths encountered in high-resolution anti-Stokes coherent Raman spectroscopy (CARS). Most of the experimental data are based on linewidth measurements using a pulse-amplified CARS spectrometer with an emission bandwidth (FWHM) of $2 \times 10^{-3} \text{ cm}^{-1}$. Detailed rotational and vibrational relaxation constants have been obtained from the analysis of the Q-branch profiles of C_2H_2 , N_2 , CH_4 , and SiH_4 .

The Application of Incoherent Light for the Study of Femtosecond-Picosecond Relaxation in Condensed Phase

T. Kobayashi, A. Terasaki, T. Hattori, K. Kurokawa (Japan)

A convenient technique for the ultrashort-relaxation-time measurement using temporally incoherent light instead of short pulses can be applied to the studies of relaxation processes. Theoretical studies on measuring various types of relaxation times by this method are summarized. We have applied this technique to the studies of the electronic dephasing in a polydiacetylene film, the vibrational dephasing in dimethylsulfoxide and the relaxation of optical Kerr effect in CS_2 and nitrobenzene.

P. A. Ruymgaart, T. T. Soong

Mathematics of Kalman-Bucy Filtering

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Contents: Elements of Probability Theory. – Calculus in Mean Square. – The Stochastic Dynamic System. – The Kalman-Bucy Filter. – A Theorem by Liptser and Shirayayev. – Appendix: Solutions to Selected Exercises. – References. – Subject Index.

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