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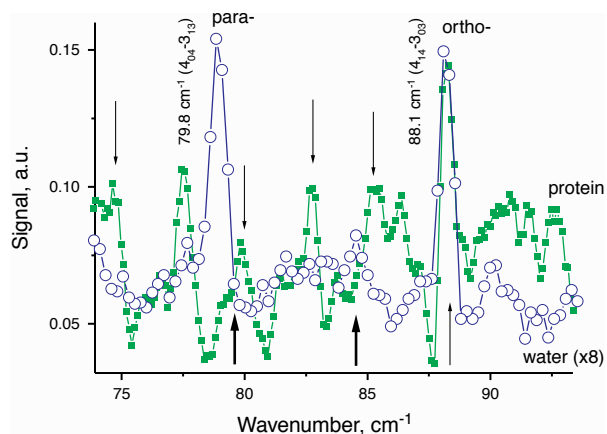


## Laser spectroscopy

A.F. Bunkin, S.M. Pershin, and A.A. Nurmatov ..... 275–277

### Four-photon spectroscopy of ortho/para spin-isomer H<sub>2</sub>O molecule in liquid water in sub-millimeter range

H<sub>2</sub>O molecules coherent librations in *Milli-Q* water and aqueous solution of  $\alpha$ -hymotripsin protein in sub-millimeter range (70–90 cm<sup>-1</sup>) are observed by four photon scattering technique for the first time. Perfect correlation of detected resonances with rotational spectrum of H<sub>2</sub>O molecules in gas phase is found. Moreover a few lines of H<sub>2</sub>O molecules ortho- and para- isomers were identified. The presence of  $\alpha$ -hymotripsin molecules in water directs to an essential gain of the four-photon signal. It was found that the protein molecule in aqueous solution interacts selectively with para-isomers of H<sub>2</sub>O molecules.

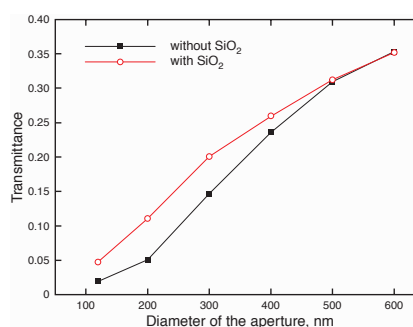


## Interaction of laser radiation with matter

Q. Gan, G. Song, and L. Chen ..... 278–282

### Oil-immersion or solid-immersion power enhancement of very-small-aperture lasers

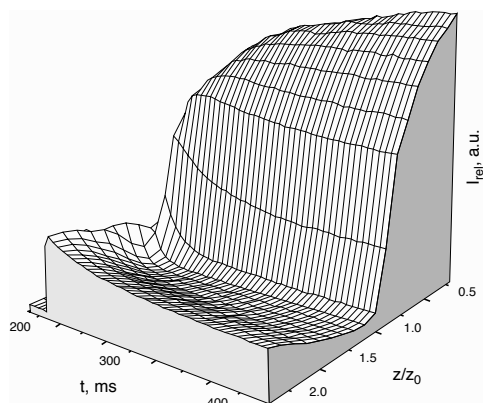
An analysis of the enhancement of light transmission through a sub-wavelength aperture by oil- or solid-immersion is presented in this letter. An output power enhancement phenomenon related to the oil-immersion or solid-immersion mechanism is realized experimentally and reported for a very-smallaperture laser, which is in agreement with simulation analysis. This phenomenon could be useful for future optical data storage, microscopy and lithography.



## Interaction of laser radiation with matter

D. Lorenc and P. Vojtek ..... 283–287

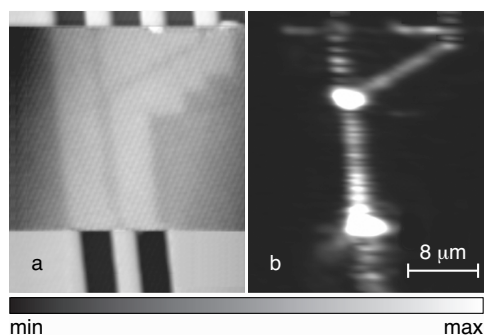
### Steady-state and transient thermal lens behavior in the dual beam Z-scan arrangement



Output beam spatial properties of a dual wavelength CW DPSS laser have been studied using the thermal lens (photothermal) effect. In employing the Z-scan technique both the steady-state and time-dependent thermal lens signal as a function of sample position could be examined simultaneously. The influence of sample thickness and laser output power upon obtained spatial properties of incident beam is studied. It is shown, that both the steady state and the transient photothermal signal provide comparable results.

V.S. Volkov, S.I. Bozhevolnyi, P.I. Borel, L.H. Frandsen, and M. Kristensen ..... 288–292

### Near-field probing of photonic crystal directional couplers

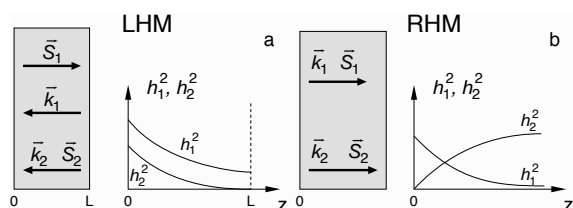


We report the design, fabrication and characterization of a photonic crystal directional coupler with a size of  $\gg 20 \times 20 \text{ } \mu\text{m}^2$  fabricated in silicon-on-insulator material. Using a scanning near-field optical microscope we demonstrate a high coupling efficiency for TM polarized light at telecom wavelengths. By comparing the near-field optical images recorded in and after the directional coupler area, the features of light distribution are analyzed. Finally, the scanning near-field optical microscope observations are found to be in agreement with the transmission measurements conducted with the same sample.

## Nonlinear and quantum physics

A.K. Popov, V.V. Slabko, and V.M. Shalaev ..... 293–297

### Second harmonic generation in left-handed metamaterials



The extraordinary properties of second harmonic generation in negative-index metamaterials, where the Poynting vector and the wavevector have opposite directions are investigated. The "backward" phase-matching condition results in significant changes in the Manley-Rowe relations and in spatial distributions of the field intensities of the coupled waves.