
Extrapolation from the solid-state structure to the molecular structure in solution is a dangerous procedure; however, some knowledge obtained from X-ray diffraction may be used to interpret observations made in solution.

Crystal structures have been determined for six complexes of the type Ln[S2P2C5H9]3 (Ln = lanthanide(III) or thorium (IV), R = Ne, Ph or OEt). The structures are eight-coordinate and dodecahedral (mmm isomer). We have found no complex of this type with the alternative square antiprismatic structure in the solid state.

1H and 31P NMR measurements on the series Ln(S2P2C5H9)3, where R is Ne, OEt or Ph, show that there is a distinct structural break at Ho with a concomitant change in the 3P hyperfine coupling. This change is shown to be from a dodecahedron to a square antiprism.

The dipolar observed for the paramagnetic complexes is proportional to (3(cos²θ - 1)/r²) where r is the distance from the paramagnetic ion to the observed nucleus, and θ is the angle between the vector r and the principal axis of the magnetic susceptibility tensor. The crystal structures above indicate that (3(cos²θ - 1) for the 3P nuclei should be about -0.6 for a dodecahedron, but close to zero for a square antiprism, whereas r should change. This agrees with the small values of the 3P dipolar shifts observed for the heavy ions compared to the light ones and with the predictions of 1gand-1gand repulsion calculations.

21.0-02 PICOSECOND TECHNIQUE OF TWO-PHOTON ABSORPTION MEASUREMENT IN CRYSTALS. By B. Barceló, G. Dickau, A. Piskarskas and V. Sirutkaitis, Faculty of Physics, Vilnius, Sauletekio al. 9, Lithuania, USSR.

Pico­sc­es­ond light pulses of great intensity interacting in nonlinear crystals take part not only in simple processes of parametric interactions. Simultaneously such nonlinear processes as multiphoton absorption, pair generation or stimulated Raman scattering occurs.

This report deals with two-photon absorption measurement in LiNbO₃, LiIO₃, Ag₃AsS₃, crystals. Our experimental setup consists of pico­­second phosphate glass master laser (PL), two-step amplifier, harmonic generator on KH₂PO₄ crystal and pulse measurement technique. The energies of excitation and probe (transmitting) pulses were measured by photodetectors and processed and stored by microcomputer iP-80. We measured the energy of transmitting pulse and its dependence on pump pulse intensity. It was possible to measure transmittance of the crystal at all points of exciting pulse. For this purpose probe pulse was automatically delayed by step­motor driven variable delay line.

First or second harmonic of P1 radiation (λ = 1064 nm or λ = 532 nm) as well as continuously tun­ed radiation was used as exciting and probe pulses. The intensity of pulses up to 40 kW/cm² was reached, single pulse duration being 5 ps. Two-photon absorption rate r = 15 MW/cm² was measured in Ag₃AsS₃,20 in LiNbO₃.

21.0-03 DETECTION OF PICOSECOND IR PULSES BY MEANS OF NONLINEAR CRYSTALS. By B. Barceló, G. Dickau, A.V. Nishchenko and V. Sirutkaitis, Faculty of Physics, Vilnius University, 230054 Vilnius, Sauletekio al. 9, Lithuania, USSR.

There are some difficulties in measuring weak ultrashort infrared light signals. Detection of such signals by means of frequency up-conversion in nonlinear crystals (with a high value of second order suscept­ibility) has been widely investigated recently. The mechanism of parametric mixing ω₁ - ω₂ + ω₃ where ω₁, ω₂ and ω₃ are the frequencies of sum, pump and probe pulses respectively is used in our experiments. It is very important that the main information of the probe pulse remains in the sum-frequency pulse. We investigated experimentally the sum-frequency generation in Rh₃PO₄ and LiIO₃ crystals cut for 0°-0° interaction. Their θ is 45° and 30° respectively (θ being the angle between the pump wave vector and the z-axis). A passively modelocked phosphate glass laser (PL) with pulse repetition rate up to 2 pps was used as a pump (G. Dikéliu et al., Kvantovaja electronica (1979), 6, No. 8, 1610, Russian ref.). As a probe pulse, we used superluminescence radiation of rhodamine 6G excited by the second harmonic of PL. We found the selectivity of IR detectors on 2.5 mm long Rh₃PO₄ to be Δλ = 80 Å, the probe pulse wave­length being λ = 580 nm; Δλ = 60 Å in the case of 5 mm long LiIO₃; and Δλ = 150 Å in the case of 1 mm long Rh₃PO₄. /ω₃ was tuned from 550 nm to 1500 nm.

21.0-04 INTERNAL ROTATION BARRIER CALCULATIONS BY THE SCF INDO OPEN SHELL METHOD IN THE 2,3-DIMETHYL-5,8-DIHYDROPSEPHENINONE RADICAL ANION. By C. Sieiro, Y.C. Smeyers and R. Cov-Yll, Dept. Electro­chem.Univ.Autònoma (Madrid) and Dpt.Crystallography (Sevilla) SPAIN.

We have obtained the 2,3-dimethyl-5,8-dihydro­xy-1,4-naphthoseleninone radical anion by electrochemical reduction of J at constant potential of -0.6 V versus sce electrode. Analysis of the epr spectrum gives the following hyperfine coupling constants: aH(CH₃) = 5.6 G, aH(=CH) = 6.01 G and aP(CH₃) = 1.9 G. The equivalence of the six methyl protons as deduced from the spectrum indicates that in the time scale of epr measurements, the two methyl groups freely rotate. In order to explain this free rotation we have previously made a study of a general potential energy function of two coupled rotors (Y.C. Smeyers, Int. J. Quantum Chem., in press). The potential energy function in the present case [C₂ᵥ symmetry] is deduced to be:

\[ V(B₁B₂) = A_{CC} \cos B₁ + A_{CC} \cos B₂ + A_{SS} \sin B₁ \sin B₂ + A_{SS} \cos B₁ \cos B₂ + A_{02} \cos B₁ \cos B₂ + A_{22} \cos B₁ \cos B₂ \]

where the possible non-equivalent contributions between the two methyl groups are: