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Spectroscopic study of mixed complexes involving phosphinic acids

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The phosphinic acids R_2POOH form one of the most stable dimer in the gas phase. The energy of dimerization reaches 25 – 60 kcal/mol per dimer, which was obtained from observations of monomer-dimer equilibrium in the gas phase at the high temperature (T ~ 400 – 600 K) [1]. The high dimerization energy is accompanied by broad (~1500 – 2000 cm^{-1}) ν(OH) band in the spectra of dimers. The same band is observed in the spectra of R_2POOH in the low-temperature inert matrices at T = 12 K [2]. A special regime of deposition of matrix allows observation of R_2POOH monomer bands because of the nonequilibrium situation in the matrices. The simultaneous deposition of phosphinic acid and some proton acceptors in the same regime gives a possibility of a mixed complexes formation despite of the much lower complexation energy of those complexes in comparison with the energy of dimerization of the phosphinic acid dimers. The spectroscopic characterization of such complexes is the aim of our study.

Here we present the spectral measurements of mixture of dimetylphosphinic acid $(CH_3)_2POOH$ and different proton acceptors B (B = N_2, CO, C_2H_2, and CD_3F) in the argon or nitrogen matrices. After the comparison with spectra of pure compounds the bands of $(CH_3)_2POOH...B$ complexes were distinguished. The main accent is made on the band in the ν(OH) region. The dependence of the shift $\Delta\nu(OH) = \nu_{complex}(OH) - \nu_{free}(OH)$ on the proton acceptor ability is analyzed.

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