

ORIENTATION DYNAMICS OF CH₃, CH₄, AND CD₄ QUANTUM ROTORS IN SOLID METHANES AT CRYOGENIC TEMPERATURES

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High-resolution EPR spectra of CH₃ radicals in the solid CH₄ and CD₄ matrices were obtained and analyzed. The change in the symmetry of a small impurity molecule freely embedded in the matrix crystal lattice in comparison with the symmetry of this molecule in the gas phase, which we found on the example of the CH₃ radical in the CH₄ and CD₄ solids, is expected to be a fairly general and important effect for spectroscopy. The data we obtained on the orientation mobility of methyl radical in the methane matrices in comparison with the results for other matrices indicate a sufficiently rapid sub-barrier reorientation of the methyl radical and the correlated tunneling reorientation of the methane molecules, which occurs even at helium temperatures in an orientationally ordered solid.