LINE ASSIGNMENTS AND GLOBAL ANALYSIS OF THE TUNNELING-ROTATIONAL MICROWAVE ABSORPTION SPECTRUM OF DIMETHYL METHYLPHOSPHONATE

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We have carried out line assignments of about 600 transitions involving levels of all six symmetry species in the G_{18} molecular symmetry group, covering J and K values of $2 \leq J \leq 6$ and $0 \leq |K| \leq 3$. The assignments are based primarily on combination difference loops and on differences in line shape for different symmetry species caused by the small internal rotor splitting patterns of the third, high-barrier methyl top. A global fit to a group-theoretically derived effective rotational Hamiltonian for this ten-dimensional vibrational tunneling problem was carried out, but a least-squares fit to nearly experimental precision for this floppy molecule required 116 parameters. From one point of view, this corresponds to a ratio of about 5 lines per parameter. From another point of view it corresponds to about 23 parameters per symmetry species (where each symmetry species can be considered, for parameter counting purposes, as a separate isolated state of the molecule.) These ratios suggest either that more data should be collected, or that a more efficient tunneling-rotational Hamiltonian should be devised. This question, as well as the physical interpretation of some of the more interesting tunneling splittings will be discussed.