ROTATIONAL SPECTRA OF $C_2D_4 - H_2S$, $C_2D_4 - D_2S$, $C_2D_4 - HDS$ and $^{13}CCH_4 - H_2S$ COMPLEXES

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The rotational spectra of $C_2D_4 - H_2S$, $C_2D_4 - D_2S$, $C_2D_4 - HDS$ and $^{13}CCH_4 - H_2S$ isotopomers have been measured. The spectra for $C_2D_4 - H_2S$, $C_2D_4 - D_2S$ and $^{13}CCH_4 - H_2S$ show four line pattern as was observed for the parent species [1]. $C_2D_4 - HDS$ shows doubling of transitions. These data combined with our earlier data of $C_2H_4 - H_2S$, $C_2H_4 - HDS$, $C_2H_4 - H_2^3S$ and $C_2H_4 - D_2S$ confirm that the smaller splitting (0.14 MHz in $(B + C)/2$ for the parent isotopomer) arises from the tunneling of ethylene hydrogens whereas the larger splitting (1.67 MHz in $(B + C)/2$ for the parent isotopomer) arises from the interchange of equivalent hydrogens of $H_2S$. The splittings observed for various isotopic substitutions confirm that the dynamics of both these motions involve both ethylene and hydrogen-sulphide. Molecular symmetry group analysis has been performed where both ethylene and hydrogen motions have been considered. The experimental intensity patterns are consistent with the calculated statistical weights.