GLOBAL ANALYSIS OF SEVERAL BANDS OF THE CF$_4$ MOLECULE

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Carbon tetrafluoride is a powerful greenhouse gas, mainly of anthropogenic origin. Its absorption spectrum is, however, still badly modeled, especially for hot bands in the strongly absorbing $\nu_3$ region. To overcome this problem, we have undertaken a systematic study of all the lower rovibrational transitions of this molecule. In particular, new far-infrared spectra recorded at the SOLEIL Synchrotron facility give access to bands implying the “forbidden” modes $\nu_1$ and $\nu_2$ which have only been investigated previously thanks to stimulated Raman spectroscopy$^a$, that is with a lower accuracy and much less data. Combined with the previous analyses performed in our group$^b$, we thus report here a new global fit of line positions of CF$_4$ by considering several transitions altogether: $\nu_2$, $2\nu_2 - \nu_2$, $\nu_4$, $2\nu_4$, $\nu_3$ and $\nu_3 - 2\nu_2$. This gives a consistent set of molecular parameters that will be of great help for the analysis of hot bands like $\nu_3 + \nu_2 - \nu_2$. A second separate global fit including the $\nu_1$, $\nu_1 - \nu_4$ and $2\nu_1 - \nu_1$ bands will also be presented.