

ON THE IMPORTANCE OF FAR-INFRARED SPECTROSCOPY FOR NON-POLAR SPHERICAL-TOP MOLECULES

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Highly-symmetric molecules like spherical-top possess no permanent dipole moment. Thus, at least in first approximation, their pure rotation spectrum is forbidden (or even strictly forbidden in the case of centrosymmetric species). It may thus seem useless to consider their far-infrared or THz spectrum. Nevertheless, this spectral region can provide invaluable information for these molecules. Firstly, in the case of tetrahedral species of type XY_4 , pure rotation lines in the ground or in excited vibrational states can be induced through centrifugal distortion. Secondly, the strict selection rules for spherical-top molecules make some fundamental levels inaccessible through direct absorption. Here again, far-infrared studies can help to reach them through the study of low-lying difference bands. Thirdly, some larger and/or heavier species possess weak bands at low wavenumbers. In this talk, we will summarize some recent studies performed on the AILES beamline of the SOLEIL Synchrotron facility that illustrate these different cases with CH_4 , CF_4 , OsO_4 , RuO_4 , $C_{10}H_{16}$, $C_6N_4H_{10}$, C_8H_8 and SF_6 .