THE CO-DIMER: NEW STATES AND TUNNELING SPLITTING

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New extensive millimeter-wave measurements of the $^{12}C^{16}O$ dimer have been made and more than 250 new spectral transitions have been observed in the frequency range of 80 - 135 GHz. Joint analysis of these and previous millimeter-wave data yielded in determination and precise location of 34 new energy levels of A^+-symmetry and 21 levels of A^--symmetry. Some of them belong to already known stacks and others make up 9 new stacks of the dimer. These new energy levels are located at energies from 8 to 18 cm^{-1} and in a free rotation limit they correspond to the states with (j_1, j_2, K) = (1, 1, 0), (1, 1, 1), (1, 1, 2) and (2, 0, 2), where j is a rotational quantum numbers of the CO monomer and K is a projection of the total angular momentum on the intermolecular axis. One newly observed state of A^+-symmetry originating at 12 cm^{-1} has K = 0 and might be tentatively attributed to the lower tunneling component of the stretching vibration of the CO-dimer.

The tunneling splitting for many different states of two isotopic modifications of the dimer, $(^{12}C^{16}O)_2$ and $(^{13}C^{16}O)_2$ was determined, and its dependence on J-, K- values and on isotopic mass was studied. For some states the tunneling splitting increases in $(^{13}C^{16}O)_2$ as compared to $(^{12}C^{16}O)_2$. Possible explanations of this anomalous behavior will be discussed.