

## HIGH RESOLUTION SPECTRA OF CARBON DIOXIDE CLUSTERS IN THE $\nu_3$ BAND REGION

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There is widespread interest in carbon dioxide clusters from a variety of experimental and theoretical perspectives. But in terms of high resolution spectroscopy, the only definitive information concerns  $(\text{CO}_2)_2$  and  $(\text{CO}_2)_3$ . The dimer has a planar slipped parallel geometry with  $C_{2h}$  symmetry.<sup>a</sup> Two isomers are known for the trimer: a planar cyclic form with  $C_{3h}$  symmetry<sup>b</sup> and a sort of “barrel-shaped” form with  $C_2$  symmetry.<sup>c</sup>

Here we analyze two new bands in the  $\text{CO}_2$   $\nu_3$  region. The first is a dimer combination band near  $2382\text{ cm}^{-1}$  whose assignment raises interesting questions about the intermolecular vibrations of  $(\text{CO}_2)_2$ .<sup>d</sup> The second band is a trimer band near  $2370\text{ cm}^{-1}$  which is very similar to one we observed previously near  $2364\text{ cm}^{-1}$ .<sup>e</sup> We assign it to a combination involving another out-of-plane vibration of the cyclic trimer. In addition to these newly assigned bands, we also discuss a number of clear and (mostly) well-resolved bands which apparently must belong to  $(\text{CO}_2)_N$  clusters with  $N$  in the range  $6 \sim 15$ . Although they cannot be precisely assigned at this time, these bands offer intriguing future prospects for learning more about the structures and vibrational dynamics of  $\text{CO}_2$  clusters in a challenging and important size range.

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<sup>a</sup>K.W. Jucks, Z.S. Huang, D. Dayton, R.E. Miller, and W.J. Lafferty, *J. Chem. Phys.* **86**, 4341 (1987); M.A. Walsh, T.H. England, T.R. Dyke, and B.J. Howard, *Chem. Phys. Lett.* **142**, 265 (1987).

<sup>b</sup>G.T. Fraser, A.S. Pine, W.J. Lafferty and R.E. Miller, *J. Chem. Phys.* **87**, 1502 (1987).

<sup>c</sup>M.J. Weida and D.J. Nesbitt, *J. Chem. Phys.* **105**, 10210 (1996).

<sup>d</sup>H. Chen and J.C. Light, *J. Chem. Phys.* **112**, 5070 (2000).

<sup>e</sup>M. Deghany, M. Afshari, N. Moazzen-Ahmadi, and A.R.W. McKellar, *J. Chem. Phys.* **128**, 064308 (2008).