

## THE VISBLE SPECTRUM OF TITANIUM DIOXIDE

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Bulk TiO<sub>2</sub> is a widely used photo-activated catalytic material, yet poorly understood. Much of the motivation for studies of molecular TiO<sub>2</sub> is the observation<sup>a</sup> that there is a smooth correlation of the molecular electronic states to the band gap of the bulk. The field-free energy levels of the ground state of the monomer have been fully characterized by microwave spectroscopy.<sup>b</sup> Here we report on the visible spectrum in the region between 18200 cm<sup>-1</sup> to 18750 cm<sup>-1</sup> of a cold molecular beam sample of TiO<sub>2</sub> using laser induced fluorescence detection and mass-selected REMPI. Bands at 18240 cm<sup>-1</sup>, 18411 cm<sup>-1</sup> and 18470 cm<sup>-1</sup> were recorded at a resolution of 40 MHz and rotationally analyzed. The dispersed fluorescence of 18411 cm<sup>-1</sup> and 18470 cm<sup>-1</sup> bands were analyzed to produce a set of vibrational parameters for the ground state. The optical Stark spectra of the 18411 cm<sup>-1</sup> and 18470 cm<sup>-1</sup> bands were recorded and analyzed to determine permanent electric dipole moments and compared with the results for the band at 18655 cm<sup>-1</sup><sup>c</sup>

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<sup>a</sup>H.J. Zhai and L.-S. Wang *JACS* **129** 3022, 2007.

<sup>b</sup>S.Brnken; H. S. P. Miller; K.M. Menten; M. C. McCarthy and P. Thaddeus *Ap. J.* **676** 1367, 2008.

<sup>c</sup>H.Wang; T.C. Steimle; C. Apetrei and J.P. Maier *PCCP* **11** 2649, 2008.