# THE VISIBLE SPECTRUM OF ZIRCONIUM DIOXIDE, $ZrO_2$

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Zirconia ($ZrO_2$) is an important material with applications in microelectronics, catalysis, and ceramics. Previously the photoelectron spectrum[a,b] of the $ZrO_2$ anion and the pure rotation spectrum of the neutral[c] have been recorded and analyzed. Here we present the first observation of the visible spectrum of $ZrO_2$ via laser induced fluorescence (LIF) and resonance enhanced multi-photon ionization (REMPI). The LIF spectrum was recorded between 17000-18900 $cm^{-1}$ at a resolution of 0.2 $cm^{-1}$ using pulsed dye laser excitation and tentatively analyzed to give harmonic vibrational parameters $\omega_1$, $\omega_2$, and $\omega_3$ for the $\tilde{A}^1B_2$ state of 495(1) $cm^{-1}$, 150(3) $cm^{-1}$ and 1045(4) $cm^{-1}$, respectively. Dispersed fluorescence spectra of thirteen bands were recorded and analyzed to give harmonic vibrational parameters $\omega_1$, $\omega_2$, and $\omega_3$ for the $X^1A_1$ state of 898 (1) $cm^{-1}$, 287(3) $cm^{-1}$ and 808(4) $cm^{-1}$, respectively. The radiative lifetimes of numerous bands have been measured and analyzed. Franck-Condon factors were calculated and used to model the REMPI and excitation spectra. A comparison with $TiO_2$ is made[d].

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