FOURIER TRANSFORM EMISSION SPECTROSCOPY OF NEW ELECTRONIC TRANSITIONS OF TiCl and TiF

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The emission spectra of TiCl and TiF have been investigated at high resolution in the red and near infrared regions. TiF and TiCl were made in a microwave discharge lamp using a mixture of $TiCl_4$ or TiF_4 vapor and He, and the spectra were recorded using a Fourier transform spectrometer. Three new TiCl bands with origins near 6938.9, 6900.2 and 6861.7 cm^{-1} have been assigned as the 0-0, 1-1 and 2-2 bands of a new $^2\Sigma - ^2\Sigma$ transition. This assignment is supported by our recent ab initio calculations on TiCl and ZrCl [Ram et al., J. Chem. Phys. 114, 3977-3987 (2001)]. The new TiF bands are located in the 12000-14000 cm^{-1} spectral region with the 0-0 band near 13232 cm^{-1}. These bands consist of four sub-bands, $^4\Delta_{1/2} - ^4\Phi_{3/2}$, $^4\Delta_{3/2} - ^4\Phi_{5/2}$, $^4\Delta_{5/2} - ^4\Phi_{7/2}$ and $^4\Delta_{7/2} - ^4\Phi_{9/2}$, of a $^4\Delta - X^4\Phi$ transition. A rotational analysis of the 0-0 and 0-1 bands has been obtained and the spectroscopic constants have been extracted.