

VIBRATION AND VIBRATION-TORSION LEVELS OF THE S_1 AND GROUND CATIONIC D_0^+ STATES OF PARA-FLUOROTOLUENE AND PARA-XYLENE BELOW 1000 cm^{-1}

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We have employed resonance-enhanced multiphoton ionisation (REMPI) spectroscopy and zero-kinetic-energy (ZEKE) spectroscopy to investigate the first excited electronic singlet (S_1) state and the cationic ground state (D_0^+) of *para*-fluorotoluene (*pFT*) and *para*-xylene (*pXyl*). Spectra have been recorded *via* a large number of selected intermediate levels, to support assignment of the vibration and vibration-torsion levels in these molecules and to investigate possible couplings.

The study of levels in this region builds upon previous work on the lower energy regions of *pFT* and *pXyl*^{a,b,c} and here we are interested in how vibration-torsion (vibtor) levels might combine and interact with vibrational ones, and so we consider the possible couplings which occur. Comparisons between the spectra of the two molecules show a close correspondence, and the influence of the second methyl rotor in *para*-xylene on the onset of intramolecular vibrational redistribution (IVR) in the S_1 state is a point of interest. This has bearing on future work which will need to consider the role of both more flexible side chains of substituted benzene molecules, and multiple side chains.

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