HIGH RESOLUTION PHOTOELECTRON SPECTROSCOPY OF 3-NITROPHENOL MEDIATED BY A DIPOLE BOUND STATE

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Typically resulting from the combustion of coal and wood, nitrophenols are found throughout the earths atmosphere. Being highly photochemically active, they may undergo photolysis in sunlight to produce nitrous acid, among other pollutants. Despite their clear atmospheric relevance, their electronic properties and photophysics remain poorly characterised.

Here, we report an investigation of, cryogenically cooled 3-nitrophenol's, electronic and vibrational structure using photoelectron and photodetachment spectroscopy as well as resonant photoelectron imaging (PEI). The electron affinity of 3-nitrophenol is measured to be 2.997 eV and an additional electronically excited state was observed approximately 3.900 eV above the ground state. Photofragmentation of the 3-nitrophenol obfuscates direct measurement of the dipole bound state meaning that the exact energy of the dipole bound state is impossible to determine from the photodetachment spectrum. The photodetachment spectrum shows around 10 clearly resolved peaks corresponding to vibrational Feshbach resonances associated with 13 of the total 36 vibrational modes present to be assigned. The electronic and vibrational data acquired as part of this work provides valuable information on the role of 3-nitrophenol compounds as atmospheric pollutants and their potential photochemistry.