A NEW SPECTROSCOPIC WINDOW ON HYDROXYL RADICALS AND THEIR ASSOCIATION REACTIONS OF SIGNIFICANCE IN THE ATMOSPHERE[a]

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The weakly bound hydrogen trioxy radical (HOOO), produced in the association reaction of the hydroxyl radical (OH) with molecular oxygen (O_2), has been postulated to play an important role in atmospherically relevant reactions. Experimental studies in this laboratory have utilized infrared action spectroscopy to probe the structure, vibrational frequencies, and stability of this weakly bound species.[a] Recent experimental and theoretical results on HOOO will be presented, and used in assessing its significance in the atmosphere.[b]
Most studies of the hydroxyl radical and its association products utilize laser-induced fluorescence on the well-characterized OH $A^2\Sigma^+$ - $X^2\Pi$ band system for detection. This laboratory has recently demonstrated a new photoionization scheme combining initial UV excitation on the $A^2\Sigma^+$ - $X^2\Pi$ band system with subsequent fixed-frequency VUV ionization via autoionizing Rydberg states.[c] The photoionization mechanism as well as the applicability of this quantum state-selective photoionization scheme will be presented.

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