

STABILITY OF HO₃ RADICAL VIA INFRARED ACTION SPECTROSCOPY

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The existence of hydrogen trioxy radicals (HO₃) has several important implications in atmospheric chemistry, as it may act as an intermediate in key chemical reactions and relaxation processes in the atmosphere. In this work, HO₃ was produced from the association of O₂ and photolytically generated OH radicals in the collisional region of a supersonic free-jet expansion. Excitation of the OH stretching vibration of HO₃ via tunable infrared radiation causes dissociation to OH + O₂, and the OH fragments are probed by laser-induced fluorescence. The IR action spectrum of HO₃ was recorded for the fundamental and first overtone OH stretches of HO₃ as well as its deuterated analog. Rotationally structured and broadened features were observed and attributed to the *trans* and *cis* conformers of HO₃. The product state distribution of the OH fragment was examined to determine the highest energetically open product channel, which sets an upper limit of 6.12 kcal mol⁻¹ for the HO-O₂ binding energy. Calculation of the equilibrium constant for the reaction OH + O₂ + M \rightleftharpoons HO₃ + M (with collision partner M) suggests that HO₃ exists in significant abundance in the vicinity of the tropopause, where it may act as a temporary sink for OH.