THE ELECTRONIC SPECTRUM AND MOLECULAR STRUCTURE OF THE ARSENYL ($H_2As{=}O$) FREE RADICAL

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The $H_2As{=}O$ radical has been identified for the first time by laser-induced fluorescence (LIF) and single vibronic level (SVL) emission techniques. The radical was generated by a pulsed electric discharge in a mixture of AsH_3 and CO_2 and high-pressure argon and detected by observation of the $\tilde{B}^2A' - \tilde{X}^2A'$ electronic transition in the 510-410 nm region. Moderate resolution LIF and SVL emission spectra of H_2AsO, D_2AsO, and HDAsO have been recorded and analysis shows unequivocally that the spectrum is due to the arsenyl radical. High-resolution spectra of the 0_0^0 bands of H_2AsO and D_2AsO, which consist of strong a-type and weaker c-type transitions, revealed spin-splittings and small, but significant arsenic hyperfine splittings due to a Fermi contact interaction in the ground state. The effective molecular structures of H_2AsO in the ground and excited states have been determined from the rotational constants and will be discussed in the context of the analogous nitroxyl ($X_2N{=}O$) and phosphonyl ($X_2P{=}O$) radicals.