

SPECTROSCOPIC CHARACTERIZATION OF THE [H, P, S, O] MOLECULAR SYSTEM AND CHEMICAL INSIGHTS INTO THE NON-DETECTION OF PHOSPHORUS- AND SULFUR-BEARING DIATOMIC MOLECULES PS AND PH

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Phosphorus and sulfur are integral to life on Earth, and their role in the chemistry of the interstellar medium is highly debated and unknown. Only a handful of phosphorus-bearing species have been detected thus far, with the most recent confirmed detection taking place in 2014. The simultaneous detection of molecules such as PO, SH, and OH indicate the possibility of reactive intermediate species existing in the interstellar medium and circumstellar envelopes of evolved stars. To explore this possibility, we have characterized the [H, P, S, O] tetratomic isomer family using high level ab initio methods. We provide rotational, vibrational, and electronic spectroscopic data to help drive experimental and observational detection of new phosphorus and sulfur-bearing molecules and explore chemical and photochemical pathways to explain possible reservoirs and sources for the as of yet undetected PH and PS diatomic molecules.