

EXOTIC METAL MOLECULES IN OXYGEN-RICH ENVELOPES: DETECTION OF AlOH ($X^1\Sigma^+$) IN VY CANIS MAJORIS

E. D. TENENBAUM and L. M. ZIURYS, *Department of Chemistry, Department of Astronomy, and Steward Observatory, University of Arizona, Tucson, AZ 85721.*

A new interstellar molecule, AlOH, has been detected toward the envelope of VY Canis Majoris, an oxygen-rich red supergiant. Three rotational transitions of AlOH were observed using the facilities of the Arizona Radio Observatory (ARO). The $J = 9 \rightarrow 8$ and $J = 7 \rightarrow 6$ lines at 1 mm were measured with the ARO Submillimeter Telescope (SMT), while the $J = 5 \rightarrow 4$ transition at 2 mm was observed with the ARO 12 m antenna on Kitt Peak. The AlOH spectra exhibit quite narrow line widths, indicating that the emission arises from within the dust acceleration zone of the central circumstellar outflow. From a radiative transfer analysis, the abundance of AlOH relative to H_2 was found to be 1×10^{-7} for a source size of $0.26''$ or $22 R_*$. AlOH is likely formed just beyond the photosphere via thermodynamic equilibrium chemistry, and then disappears due to dust condensation. The AlOH/AlO abundance ratio found in VY CMa is ~ 17 . LTE calculations predict the monohydroxides should be the major carriers of Al, Ca, and Mg in O-rich envelopes, as opposed to the oxides or halides.