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## On the upper atmospheric chemiluminescent emission observed upon release of aluminum vapor and its compounds

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Journal of Geophysical Research, vol. 86, Oct. 1, 1981, p. 9125-9136.

Upper atmospheric chemical releases of aluminum vapor and gaseous aluminum compounds have been used to determine a number of atmospheric properties in the 90 to 220-km altitude range. Visible radiation from nighttime releases is due to a chemiluminescent reaction which has been traditionally identified as the radiative combination of AlO with atomic oxygen to form electronically excited AlO<sub>2</sub>. Atmospheric release data are reviewed which eliminate this traditional mechanism. Results from laboratory experiments are presented which indicate key roles for electronically excited HAIOH formed in a direct insertion reaction of atomic aluminum with water vapor and AlO (asterisk)(A<sub>2</sub>π) formed via the reaction of oxygen atoms with weakly bound aluminum adducts. These new mechanisms significantly influence the nature of input data for atmospheric models.

Keywords: ALUMINUM, ATMOSPHERIC CHEMISTRY, CHEMILUMINESCENCE, METAL VAPORS, NIGHTGLOW, UPPER ATMOSPHERE, ALUMINUM COMPOUNDS, ATMOSPHERIC MODELS, MOLECULAR EXCITATION, OXYGEN RECOMBINATION, REACTION KINETICS, SPECTRUM ANALYSIS, WATER VAPOR

DOI: [10.1029/JA086iA11p09125](https://doi.org/10.1029/JA086iA11p09125)



The ADS is Operated by the [Smithsonian Astrophysical Observatory](#) under [NASA](#) Grant NNX09AB39G