SPECTROSCOPIC STUDY OF THE $Ga(CH_3)_3$ PLUS HN_3 REACTION SYSTEM IN LOW TEMPERATURE ARGON MATRICES

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During the past several years, infrared and UV absorption spectroscopy and low temperature matrix isolation have been used to probe the photolytic mechanisms of Group III-azide systems. These systems have the propensity to decompose to form nitride films, and hence are of considerable practical interest. The first compounds studied were the boron-azide molecules, $B(N_3)_3$, $BCl(N_3)_2$ and BCl_2N_3, species which can be generated in the gas phase reaction between BCl_3 and HN_3 by adjusting the stoichiometic ratio of the reagents. Their photolysis mechanisms were probed by depositing the products of the reaction in low temperature argon matrices and following changes in the IR and UV spectra during broad band photolysis of the matrices.(1,2,3) New photolytic intermediates were identified via their IR spectra. Other Group III-azide systems of interest include the gallium- and the aluminum-azides, and this presentation will report the spectroscopic information obtained for the gallium-azide system using the low temperature matrix isolation technique. Results of previous studies of the gallium-azide reaction system indicated that $Ga(CH_3)_3$ and HN_3 do not react in the gas phase.(4) Rather, a slow surface reaction between $Ga(CH_3)_3$ adsorbed on the walls and HN-$_3$ was observed, the rate of which increased upon irradiation at 254 nm. GaN and GaN_3 containing species formed on the walls of the reaction vessel. In this presentation, a spectroscopic study of the $Ga(CH_3)_3$ + HN_3 reaction system with 254 nm irradiation will be discussed and IR and UV spectra will be reported. 1. I. A. Al-Jihad, B. Liu, C. J. Linnen, J. V. Gilbert, J. Phys. Chem., 1998, 102, 6220. 2. L. A. Johnson, S. A. Sturgis, I. A. Al-Jihad, B. Liu, J. V. Gilbert, J. Phys. Chem. A, 1999, 103, 686. 3. M. J. Travers, E. L. Eldenburg, J. V. Gilbert, J. Phys. Chem. A, 1999, 103, 9661. 4. C. J. Linnen, R. D. Coombe, Applied Phys. Lett., 1998, 72, 88.