PHOTOLYSIS OF GROUP III-AZIDE MOLECULES ISOLATED IN LOW TEMPERATURE ARGON MATRICES: INFRARED SPECTRA OF THE PARENT MOLECULES AND OF THE PHOTO-INTERMEDIATES

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Infrared and UV absorption spectroscopy is being used with low temperature matrix isolation to probe the photolytic mechanism by which an interesting series of Group III-azide compounds decompose to form nitride films. These molecules can be synthesized in the gas phase at room temperature and decompose spontaneously or upon broad band UV irradiation without the requirement of excessive energy input from a laser, high heat or plasma discharge. (1,2) The simplicity of these systems makes them amenable to mechanistic studies of film formation, and one of the goals of this research is to identify the intermediates that form upon UV photolysis. The molecules that have been isolated in argon matrices include $B(N_3)_3$, $BCl_2(N_3)$ and $Al(N_3)_3$. In the case of $B(N_3)_3$, the photolytic intermediate has been identified as the linear molecule NNBN and has an infrared spectrum that is very similar to CNCN, an isomer of cyanogen. (3) Photolysis of $BCl_2(N_3)$ generates an intermediate that has tentatively been identified as the linear species ClBNCl on the basis of its IR spectrum. The UV absorption spectrum of the matrix following the photolysis of $BCl_2(N_3)$ shows a single sharp absorption peak at 276 nm, assigned to BCl, as well as another group of bands between 350 and 410 nm. The species responsible for the 350 to 410 nm bands has not been identified. Photolytic decomposition mechanisms will be presented that take into account the formation of these intermediate species.

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