MATRIX ISOLATION SPECTROSCOPY OF URANIUM NITRIDES.

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NUN has been previously isolated in solid Ar at 15K by mixing laser ablated uranium with N_2.[a] The formation of this molecule as well as various other uranium nitrides was verified by infrared absorptions. In this work we searched for fluorescent transitions from these same molecules, which correspond to low-lying electronic states. Pulsed laser excitation was examined using the harmonics from an Nd/YAG laser (266 and 355 nm), an XeCl excimer laser (308 nm) and a dye laser operating in the 400-585 nm range. Several absorption and emission band systems were observed, whose presence depended on the concentration of N_2 added to the Ar. When 1% N_2 / Ar mixture was used we observed a series of bands belonging to the $UN_2(N_2)_X$. Fluorescence decay lifetimes were found to be slow (tens of microseconds) for these bands. Reducing the N_2 concentration to 0.5% in Ar showed a different series of bands which we assign uranium clusters. Fluorescence decay lifetimes for these bands were found to be fast (tens of nanoseconds). Assignment of the electronic transitions for both of these molecules is discussed in terms of the electronic structure of the 6 + oxidation state of uranium .

[a]R. D. Hunt, J. T. Yustein, and L. Andrews, Journal of Chemical Physics 98 (8), 6070 (1993)..