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LUMINESCENCE FROM ADENINE IN ARGON MATRICES AT 12 K

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Matrix isolation technique offers a certain advantages compared to the other methods. In a dilute gas matrix each solute is completely surrounded with inert, non-polar hosts, usually argon or nitrogen molecules. Besides minimizing the host-solute interactions, the hosts are transparent to UV radiation (up to 170 nm for N_2) and free of fluorescent impurities.

The synchrotron light from U9B station at National Synchrotron Light Source at Brookhaven National Laboratory has been used to excite adenine embedded into low temperature argon matrix. Measured absorption spectrum is similar to those reported in the other environment with two exceptions: the higher energy part of the spectrum shows much higher intensity then previously reported and weak apparent absorption peak with maximum at 280 nm is present.

Fluorescence spectra recoded at four different excitations show the similarity in peak position and shape of the spectra.

Fluorescence excitation spectra revealed five well resolved peaks which correspond to the features resolved in the absorption spectrum, however with much better resolution.

The obtained fluorescence lifetimes calculated for different excitations were fitted with a double exponential decay with a shorter lifetime between 1.7 and 3.3 ns and longer component with lifetime varying from 15 to 23 ns. At the excitation at 180 nm, monoexponential fit with lifetime of 3.3 ns was required.

It has been also shown that deactivation processes in adenine depend on excitation energy. Excitation at 267 nm and 285 nm, besides fluorescence, produced electronically excited triplet, with a very characteristic structured phosphorescence spectrum.

Matrix isolation technique used with synchrotron radiation from UV range offers insight into photophysical processes, unperturbed by environment, occurring in biologically important molecule of adenine.