

Absorption Spectrum of N₂ in 80-100 nm Wavelength Region

Jan-Bai Nee (倪簡白)¹, Kuan-Yu Chang (張光宇)¹, and Hok-Sum Fung (馮學深)²

¹Department of Physics, National Central University, Chungli, Taiwan

²National Synchrotron Radiation Research Center, Hsinchu, Taiwan

By using VUV radiation from the Seya beam line, we have investigated the absorption spectrum of N₂. The experiment is conducted in a windowless system where gas cell is isolated from the monochromator by using a differential pumping system. Gas is introduced into the cell in a flow condition for a path length of about 20 cm in geometric length. The physical absorption length is uncertain due to violent pumping but can be calibrated by using absorption spectrum of known gases. In this case we used O₂ for the calibration.

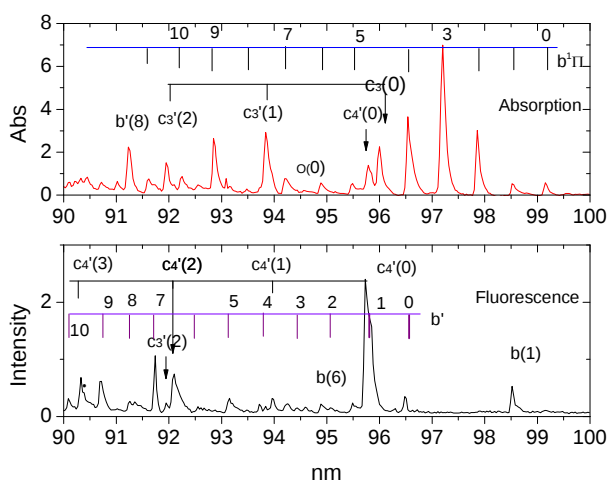


Figure 1. Absorption and fluorescence excitation spectrum for N₂ in 90-100 nm wavelength region.

Figure 1 shows the absorption and fluorescence excitation spectra (FES) in 90-100 nm wavelength region. The excited states b'¹Π_u (v'=9-12), b'¹Σ_u (v'=6-9), c₄¹Σ_u (v'=2-3) can be observed in the absorption spectrum. However, fluorescence in VUV region was observed for the b'¹Σ_u in v'=7 and v'=9 states, and the c₄¹Σ_u (v'=2-3) states. The b'¹Π_u state is strongly predissociative. The c₄¹Σ_u (v'=0) gives the strongest fluorescence.

It is interesting the b'¹Π_u state starts the absorption spectrum and b(1) is more radiative than the ground vibrational state b(0). This indicates the predissociation of the b state. A more detailed bands structures of the absorption spectrum of N₂(b) is shown in Fig. 2 for lowest 6 vibrational levels of b state.

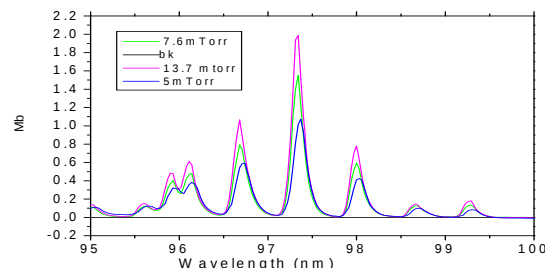


Figure 2. The fluorescence excitation spectra of N₂ in 95-100 nm.

In the region 80-90 nm, we found absorption of b'¹Σ_u state and some c and c' states. We can see again the predissociation of the excited states by comparing with the FES.

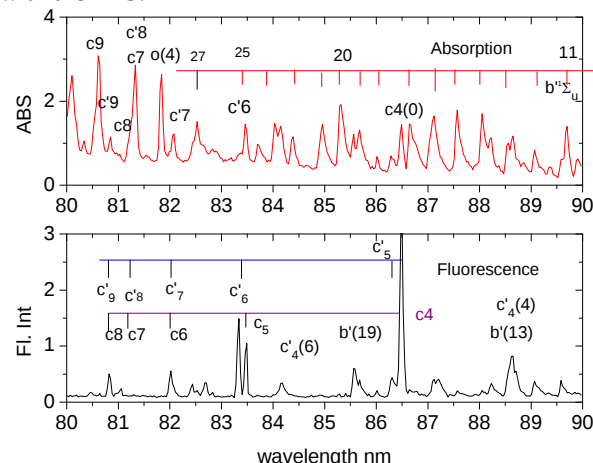


Figure 3. The absorption and fluorescence excitation spectrum for N₂ in 80-90 nm.