

UV RESONANCE RAMAN STUDIES OF BENZENE DERIVATIVES,  
AROMATIC AMINO ACIDS AND POLYCYCLIC AROMATIC HYDROCARBONS

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Using a new resonance Raman (RR) spectrometer continuously tunable between 217-800 nm (1), we have begun investigations of the excitation profiles (RREP) of benzene derivatives. A frequency doubled Nd Yag laser-pumped dye laser is frequency doubled to generate light in the 260-400 nm UV spectral region, and is mixed with the Yag fundamental to generate light between 217-260 nm. A Reticon multichannel array detects the Raman scattered light dispersed by a triple spectrograph.

For benzene no resonance enhancement is observed for the forbidden  $B_{2u}$  transition at ca 260 nm. The RR intensity arises from the  $E_{1u}$  and  $B_{1u}$  states at 185 and 205 nm and other states in the far UV. Destructive interference phenomena previously predicted by Ziegler and Albrecht (2) lead to a decreased Raman intensity in the  $B_{2u}$  state. In contrast, substituted benzene derivatives show strong RR enhancements in their ca 240 nm absorption bands. Fig.1 shows the excitation profile of the  $993\text{ cm}^{-1}$  peak of phenolate.

Numerous strong narrow excitation profile features are observed for the aromatic amino acids tyrosine and tryptophan. Fig. 2 shows the RR spectra of phenylalanine, tyrosine and tryptophan. The narrow excitation profile features observed for the aromatic amino acids indicate that a judicious choice of excitation wavelength will allow selective enhancement of particular aromatic amino acids in proteins.

Polycyclic aromatic hydrocarbons (PAH) such as naphthalene, and pyrene show intense UV RR spectra which permit the observation of these species at  $<10^{-6}\text{M}$  concentrations. Fig. 3 shows the RR spectra of a series of PAH derivatives excited at 256 nm.

We are able to measure PAH ring systems in complex samples. Fig. 4 shows the UVR of a solution of a 250-450°C distillate of a coal liquid excited at 256, 235, 230 and 225 nm. Different excitation wavelengths enhance different ring systems. Neither fluorescence

nor photochemistry significantly interferes with UVRV spectral measurements.

1. S. A. Asher, C. R. Johnson and J. Murtaugh, *Rev. Sci. Instr.* **54**, 1657 (1983).
2. L.D. Zeigler and A. C. Albrecht, *J. Chem. Phys.* **67**, 2753 (1977).

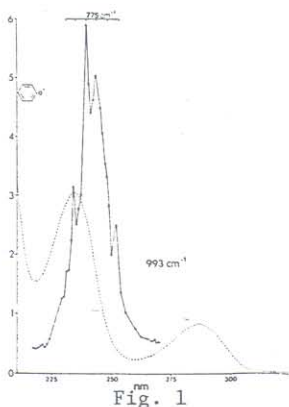


Fig. 1

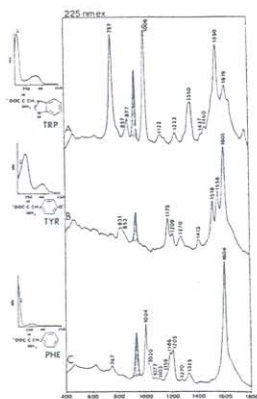


Fig. 2

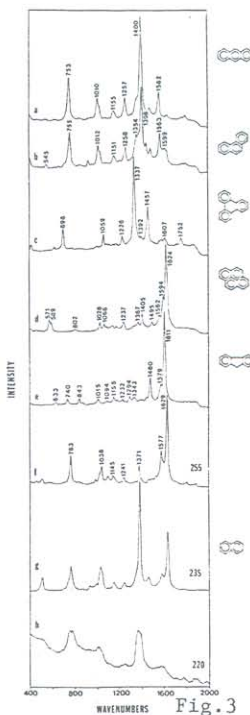


Fig. 3

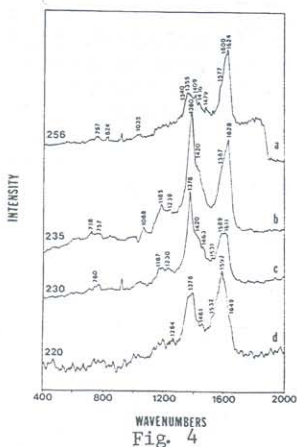


Fig. 4