

# **Applications of the Raman spectroscopy and Surface enhanced Raman spectroscopy (SERS)**

Materials for Raman Spectroscopy experiments

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Department of Chemistry

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Department of Biology

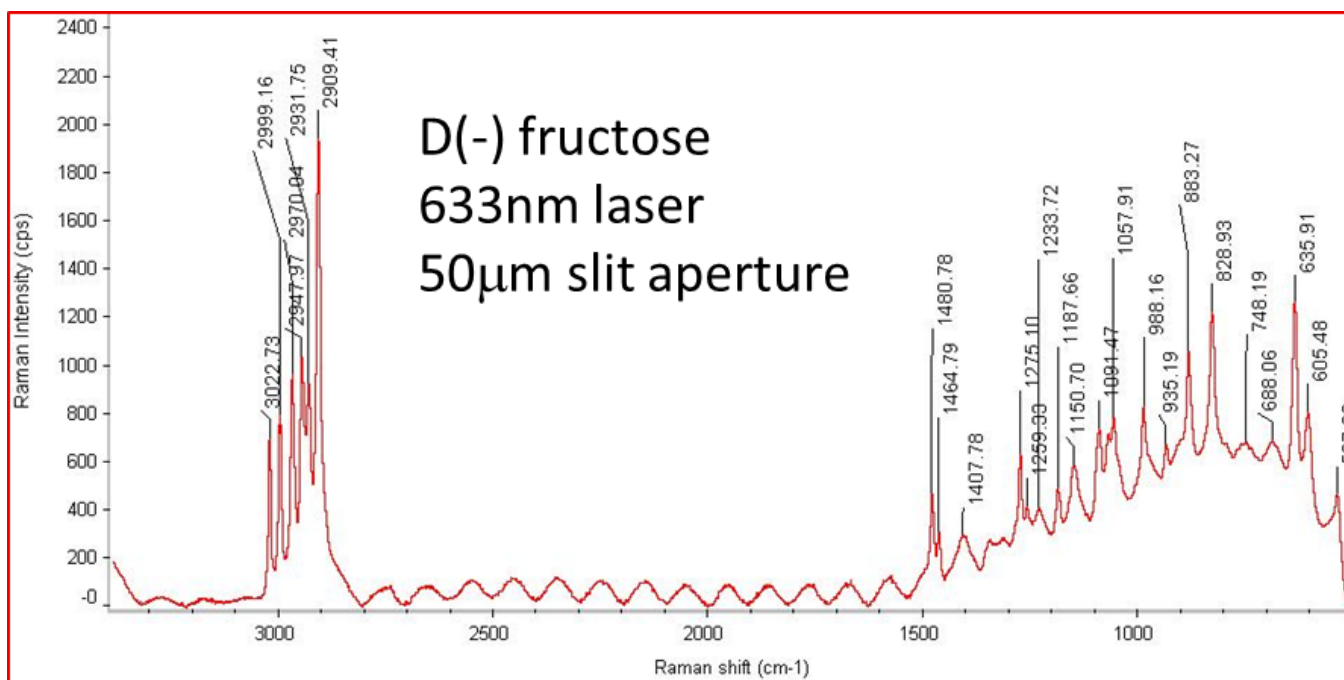
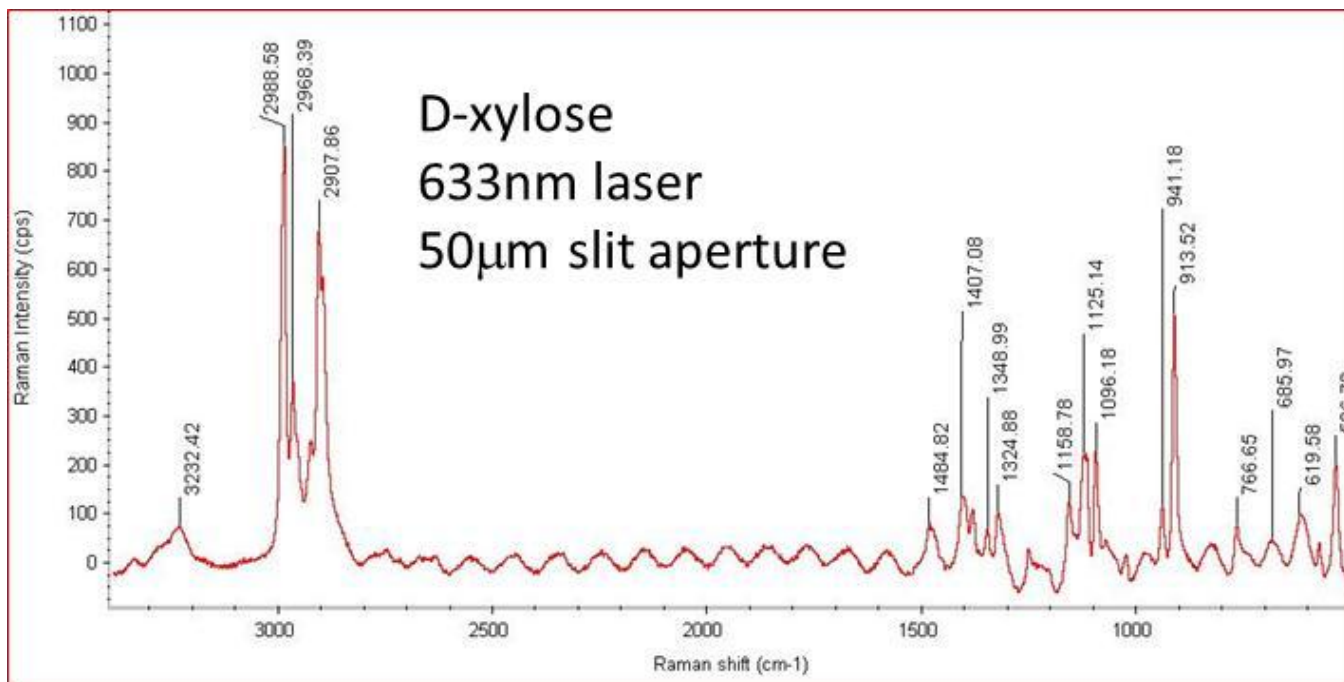
NSF Grant No. 0941364

## Raman Spectroscopy

- Sugars

D-xylose

D-fructose

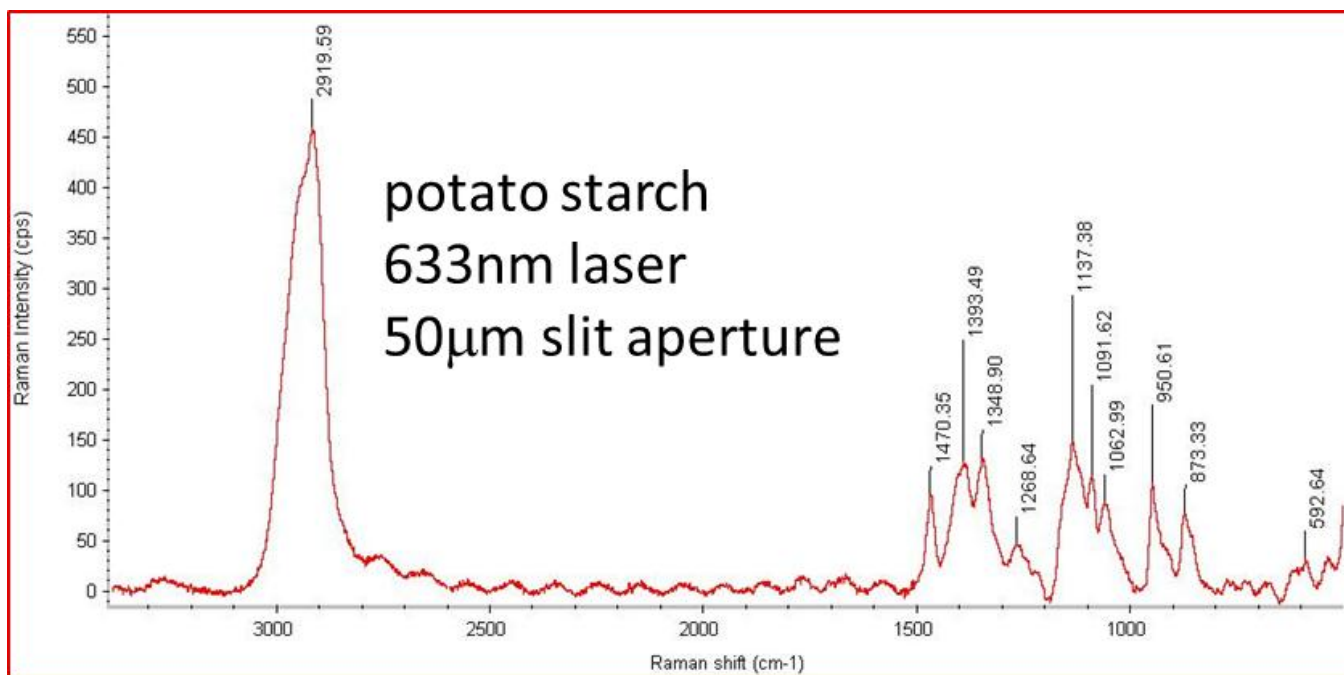
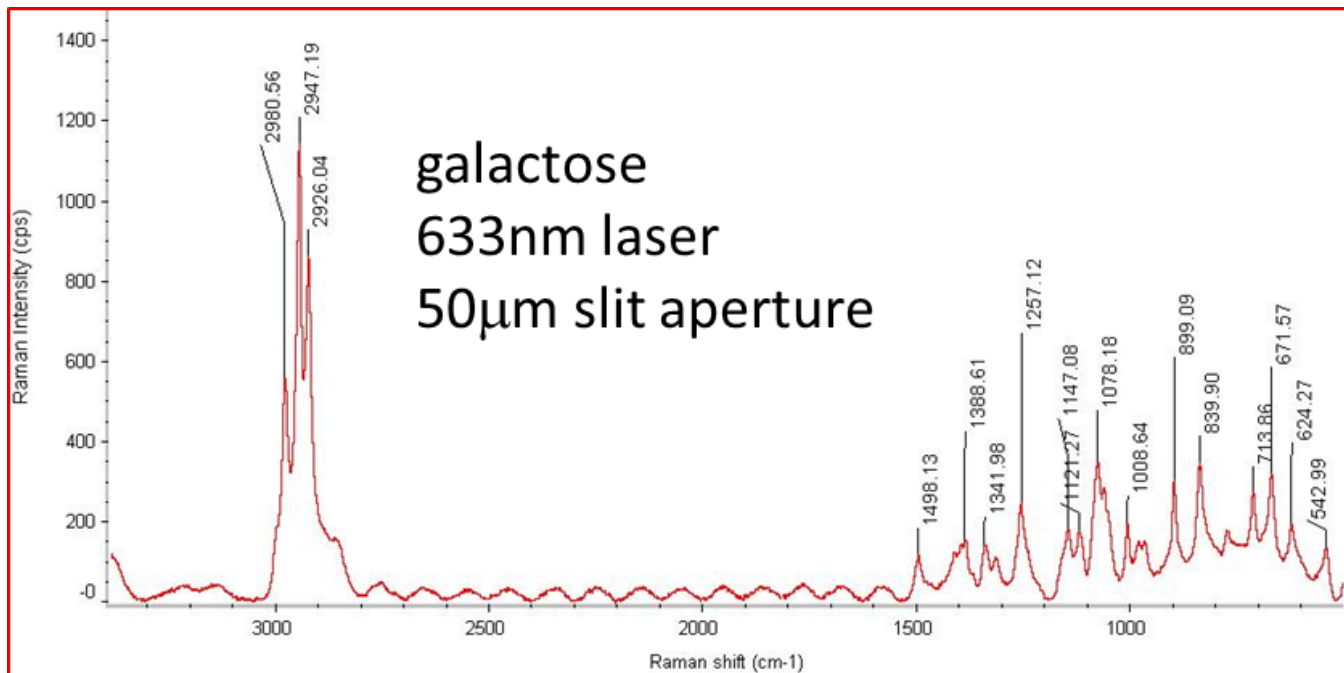


## Raman Spectroscopy

- **Sugars**

galactose

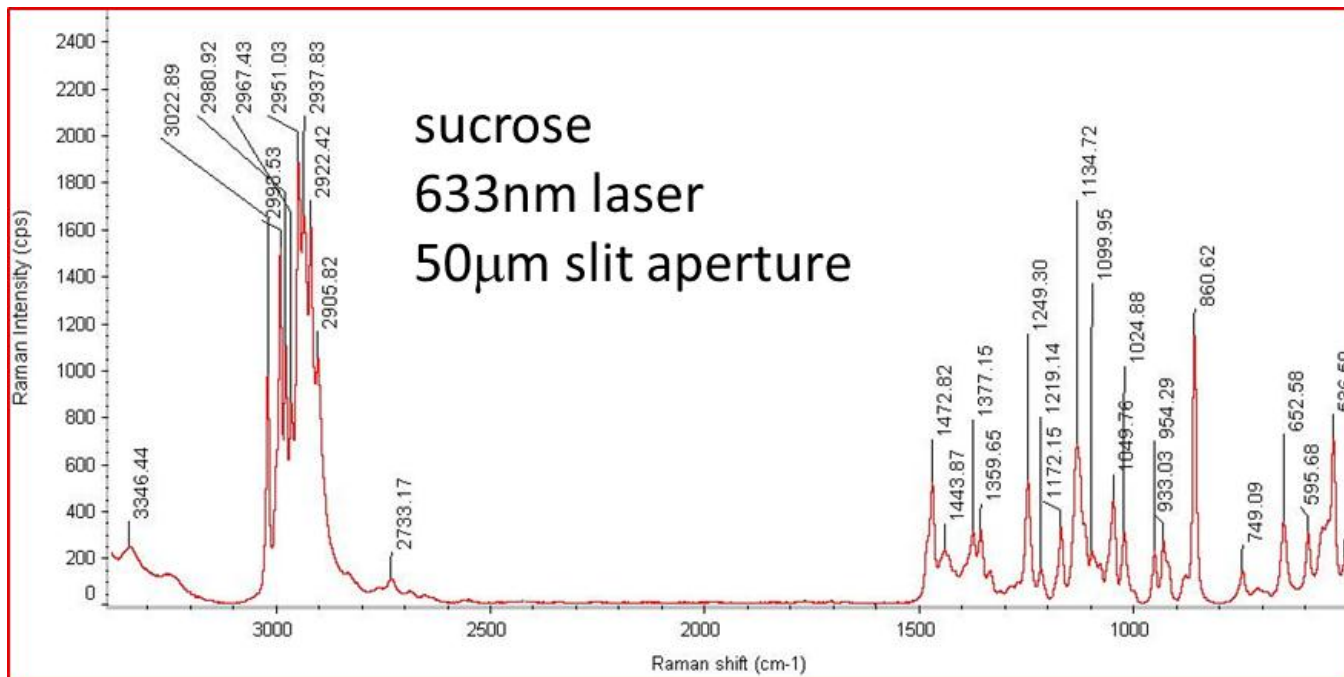
potato starch



## Raman Spectroscopy

- Sugars

sucrose

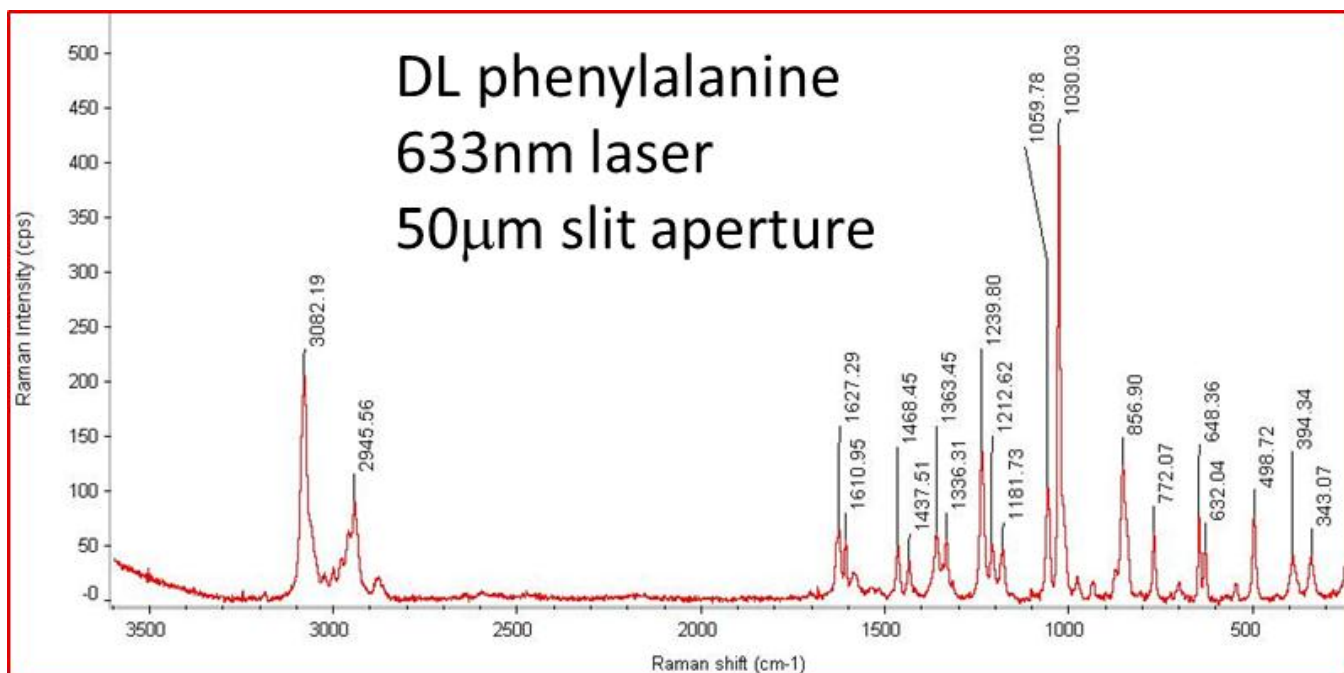
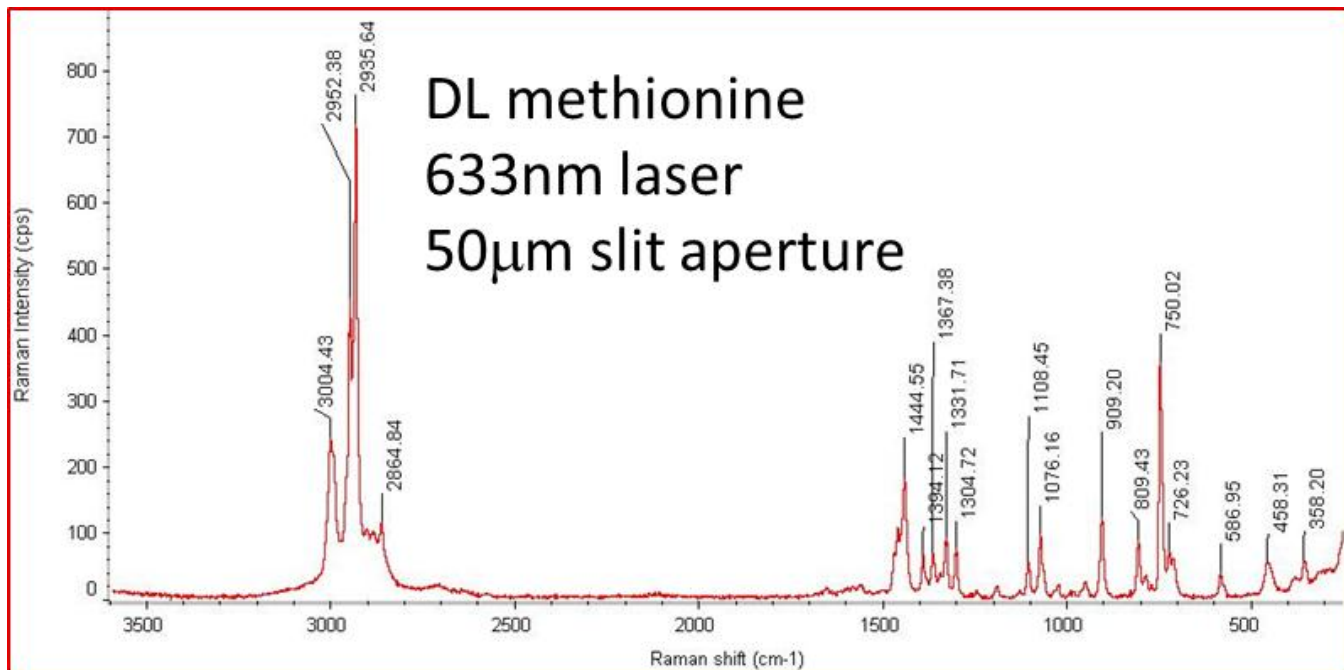


## Raman Spectroscopy

- Amino Acids

DL-methionine

DL-phenylalanine

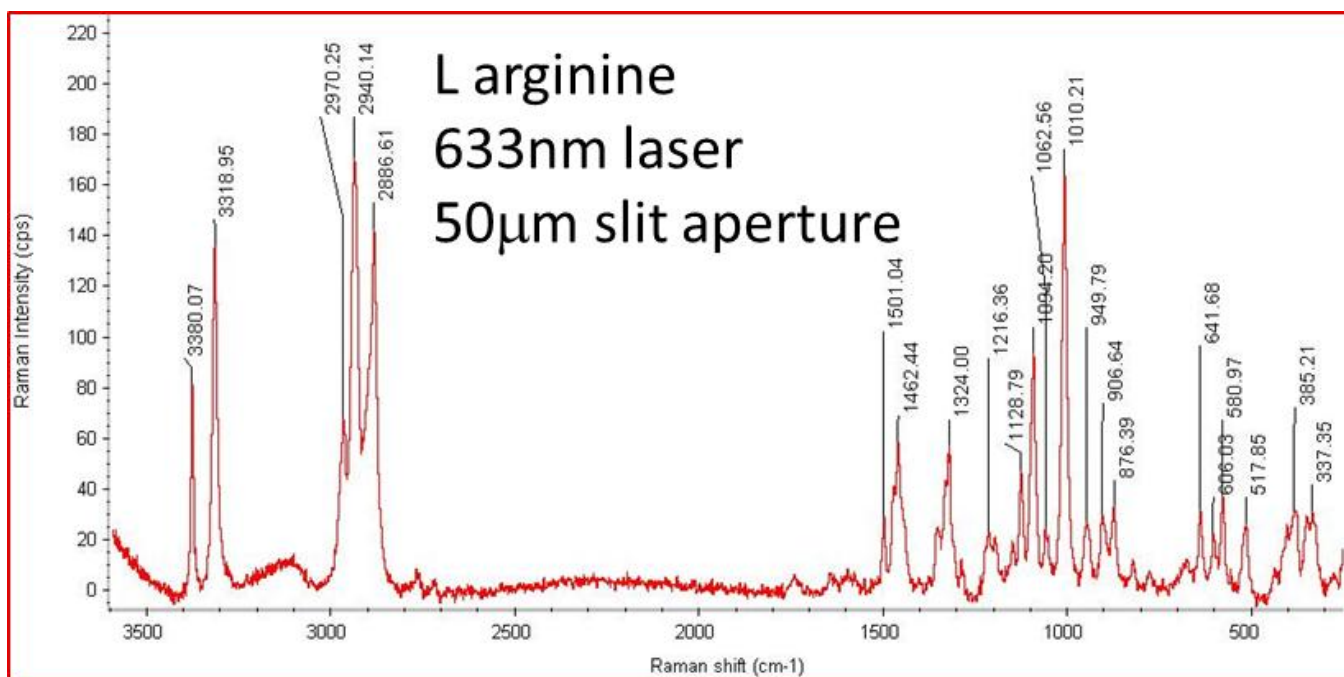
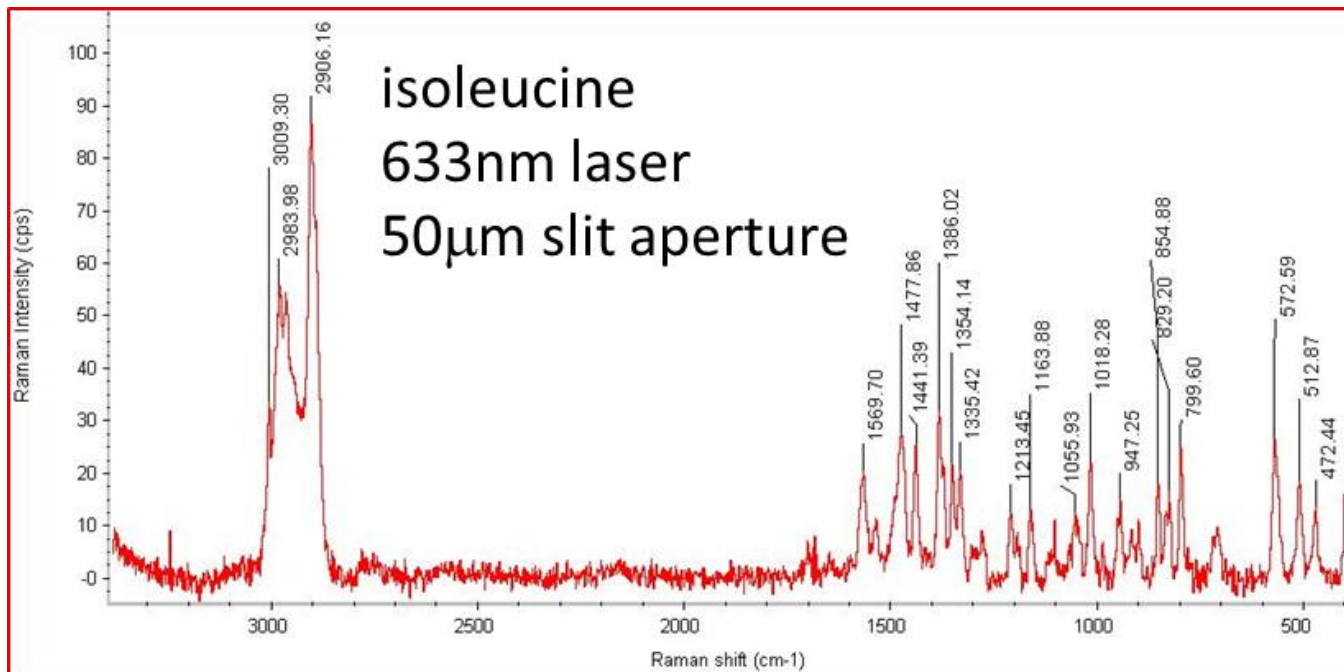


## Raman Spectroscopy

- Amino Acids

isoleucine

L-arginine



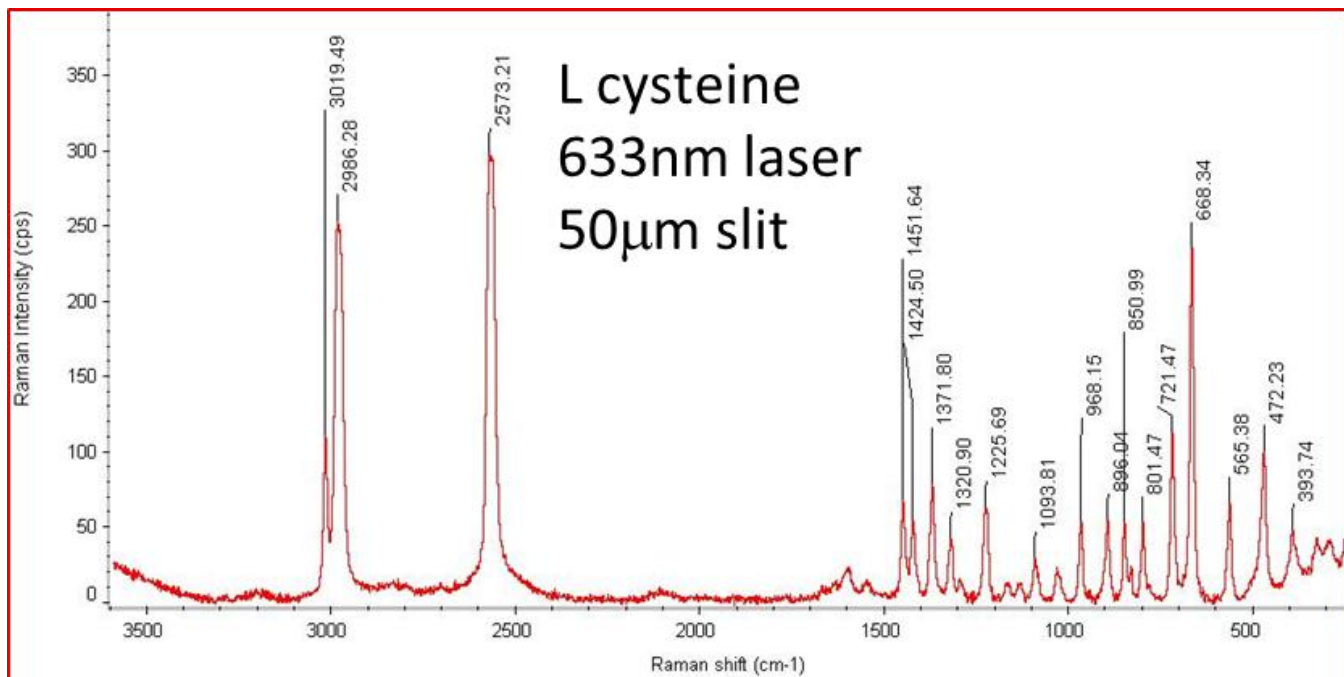
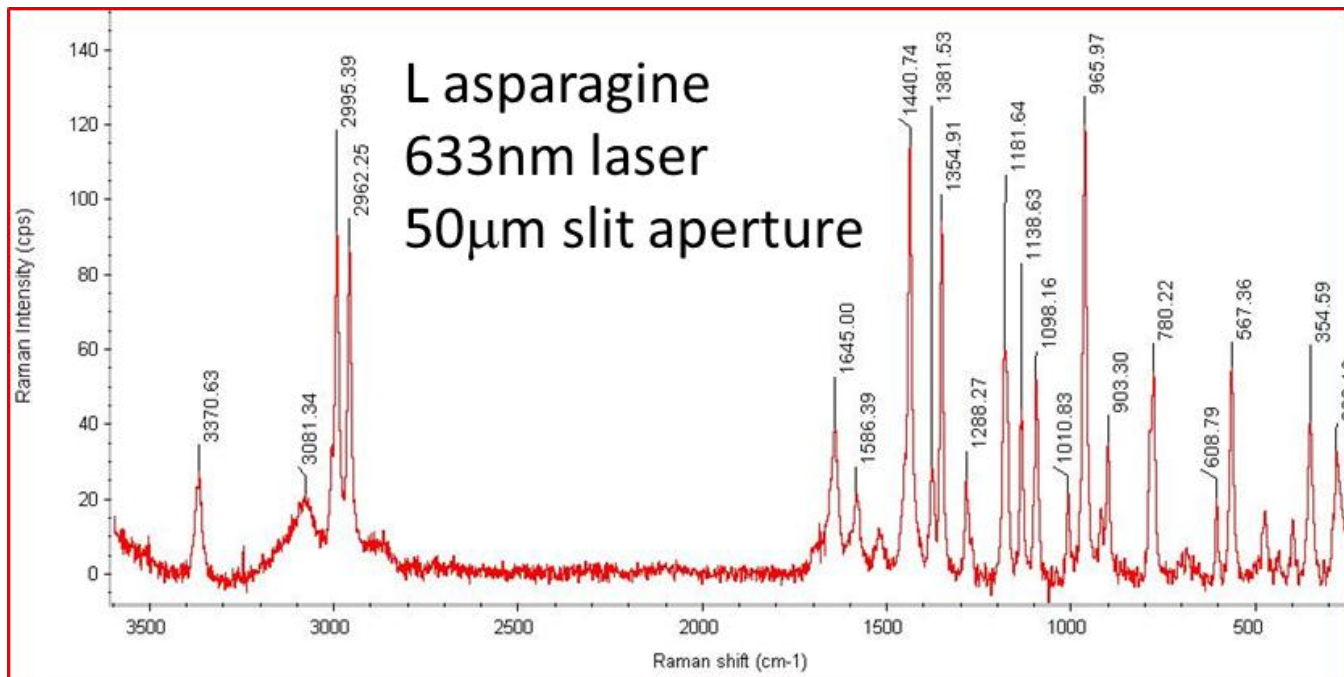


## Raman Spectroscopy

- Amino Acids

L-asparagine

L-cysteine

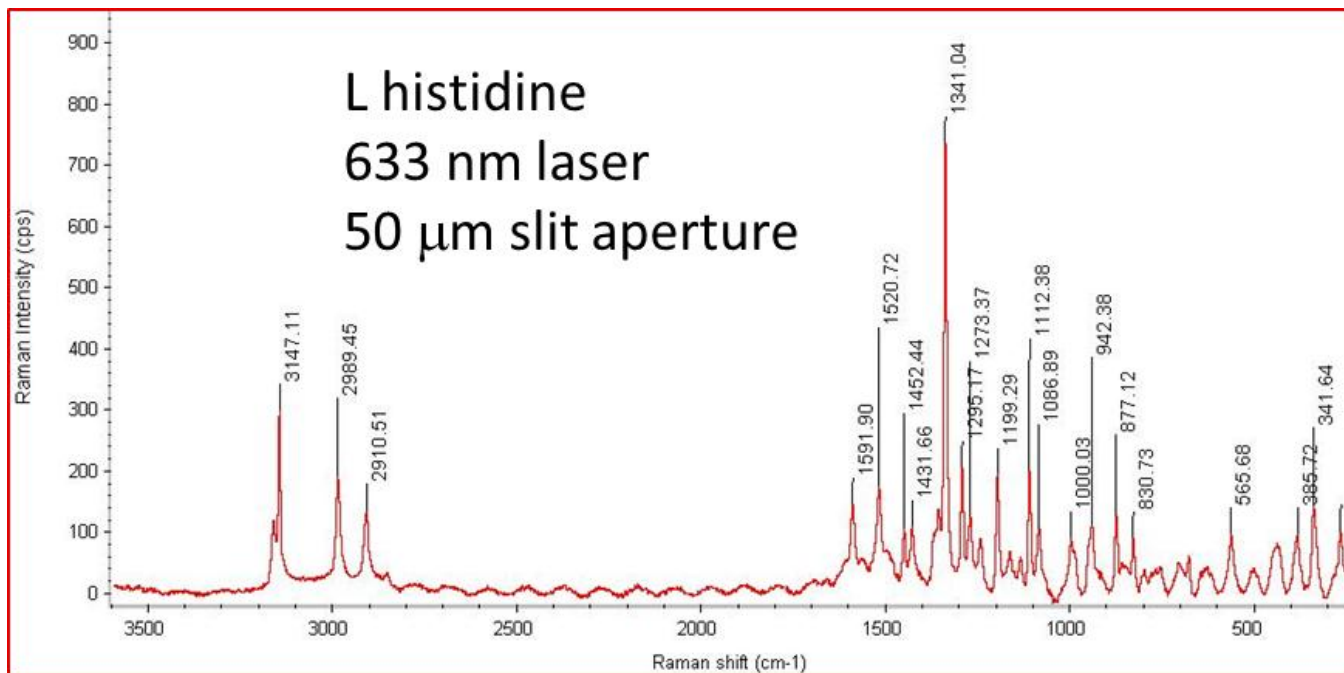
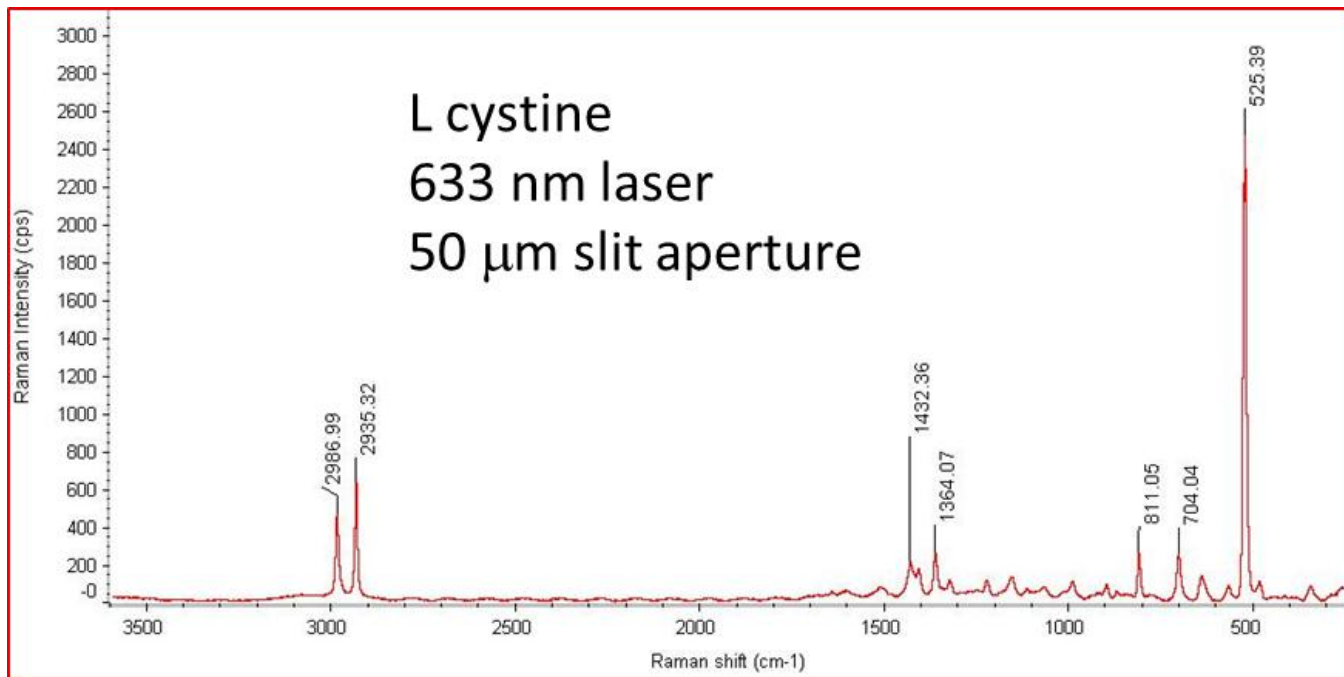


## Raman Spectroscopy

- Amino Acids

L-cystine

L-histidine



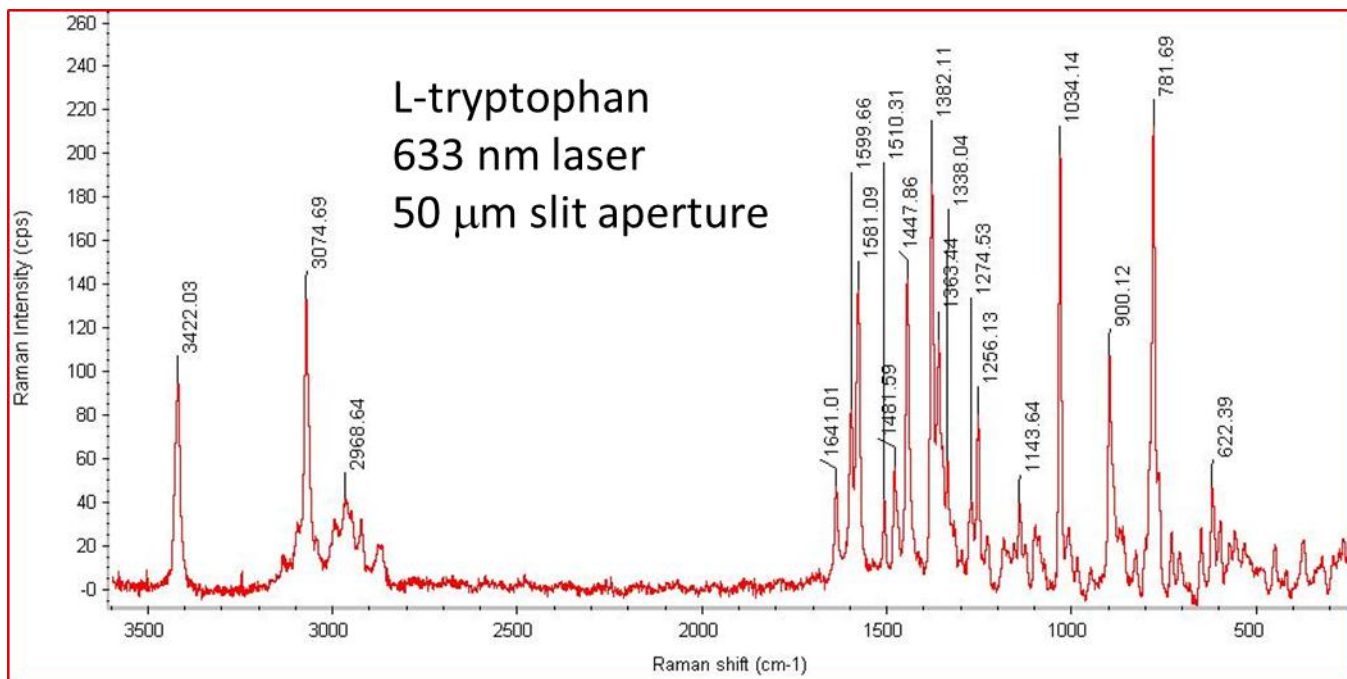
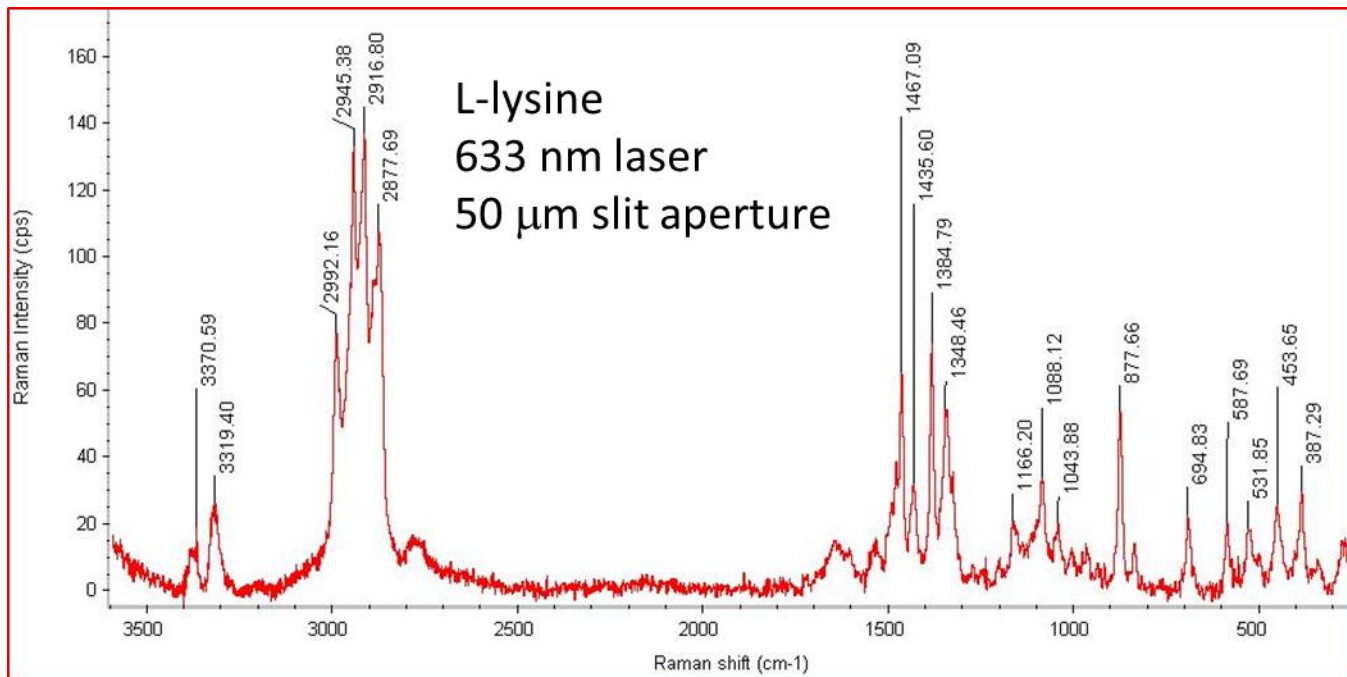


## Raman Spectroscopy

- Amino Acids

L-lysine

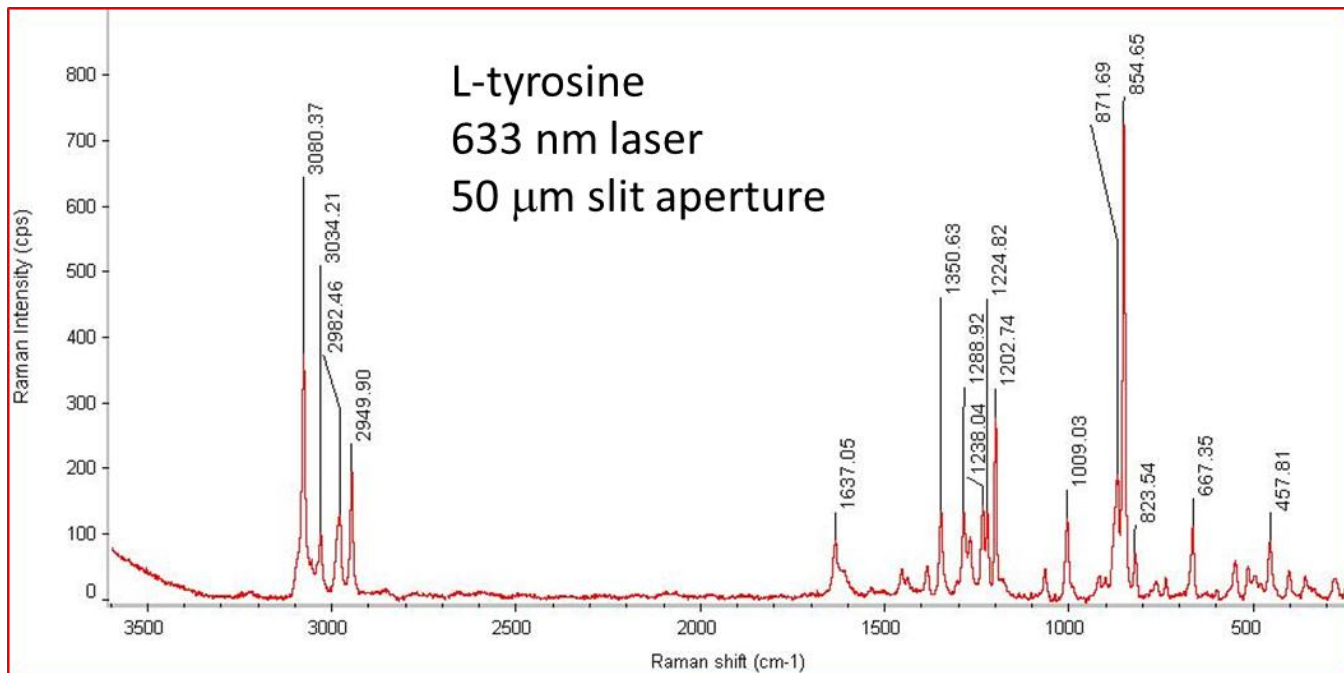
L-tryptophan



## Raman Spectroscopy

- Amino Acids

L-tyrosine

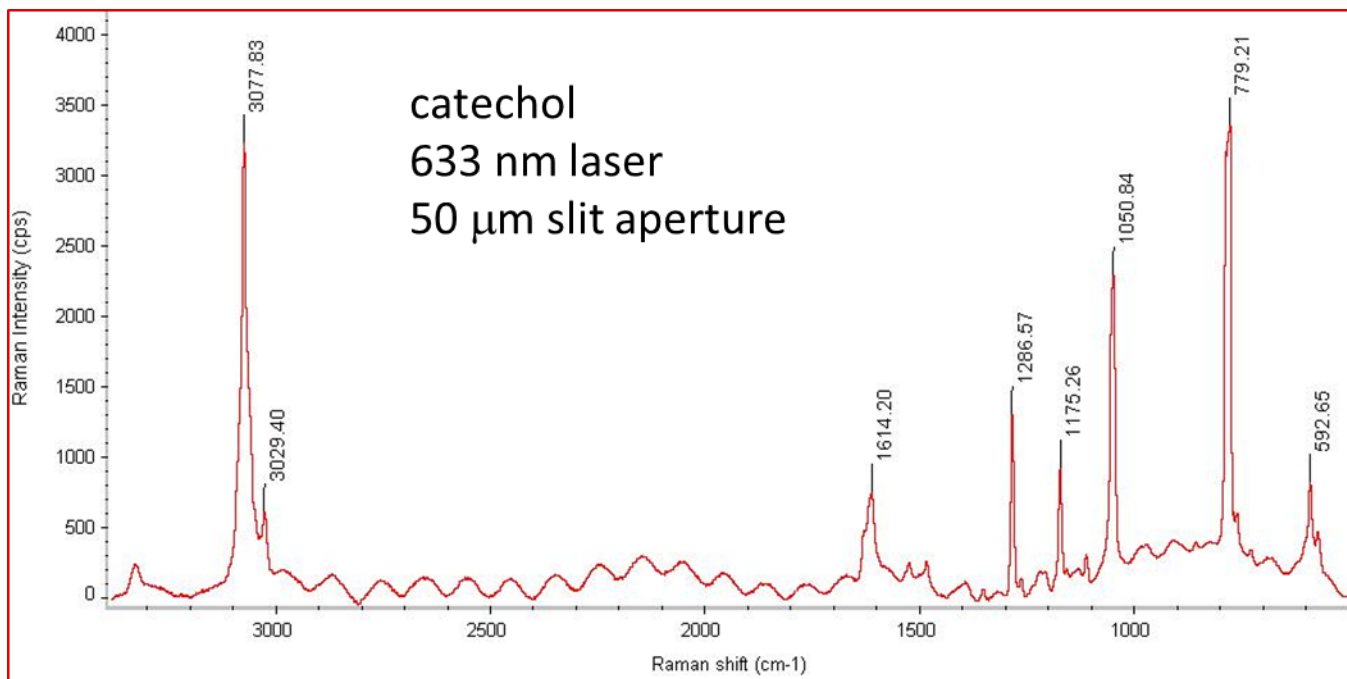
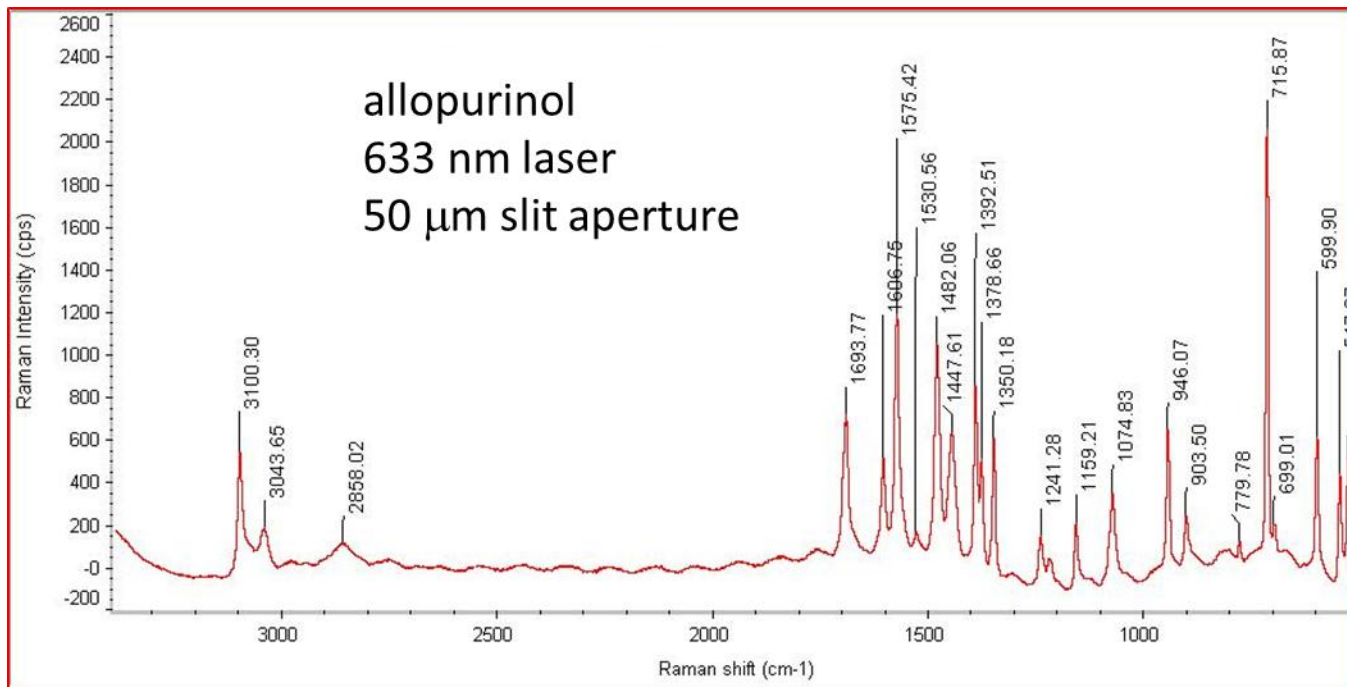


## Raman Spectroscopy

- Other Compounds

allopurinol

catechol

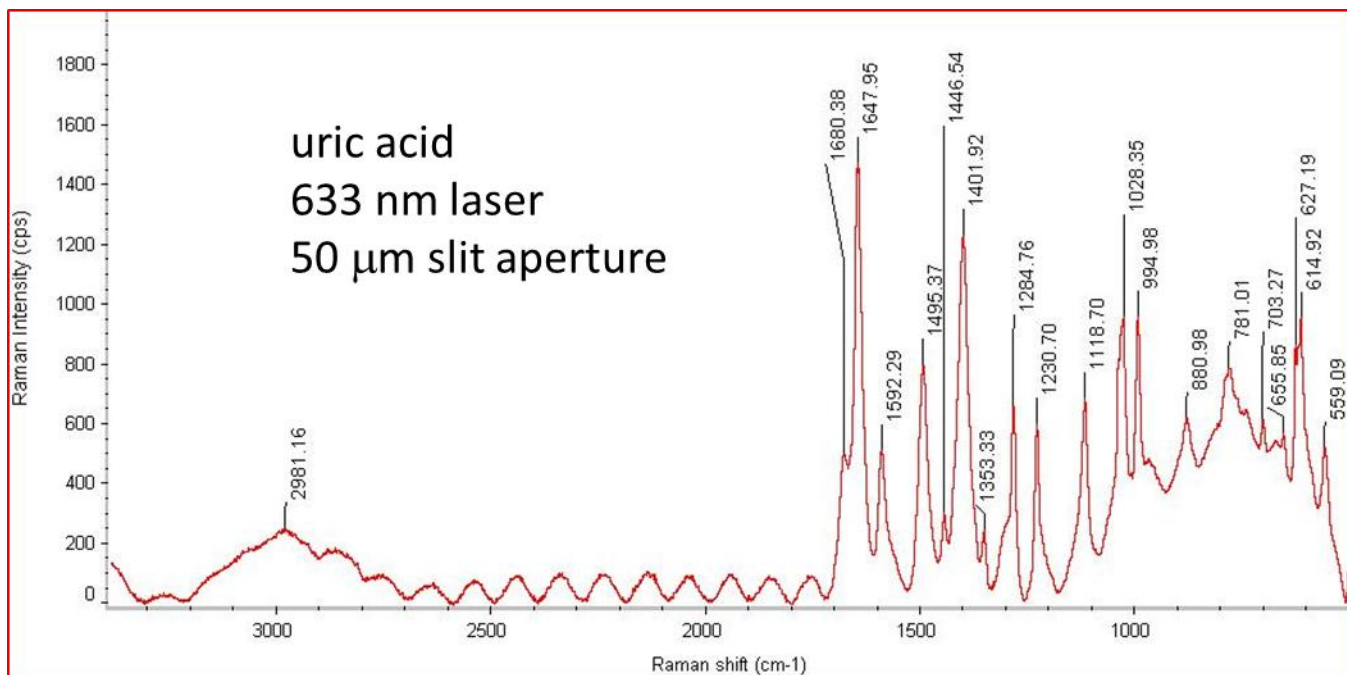
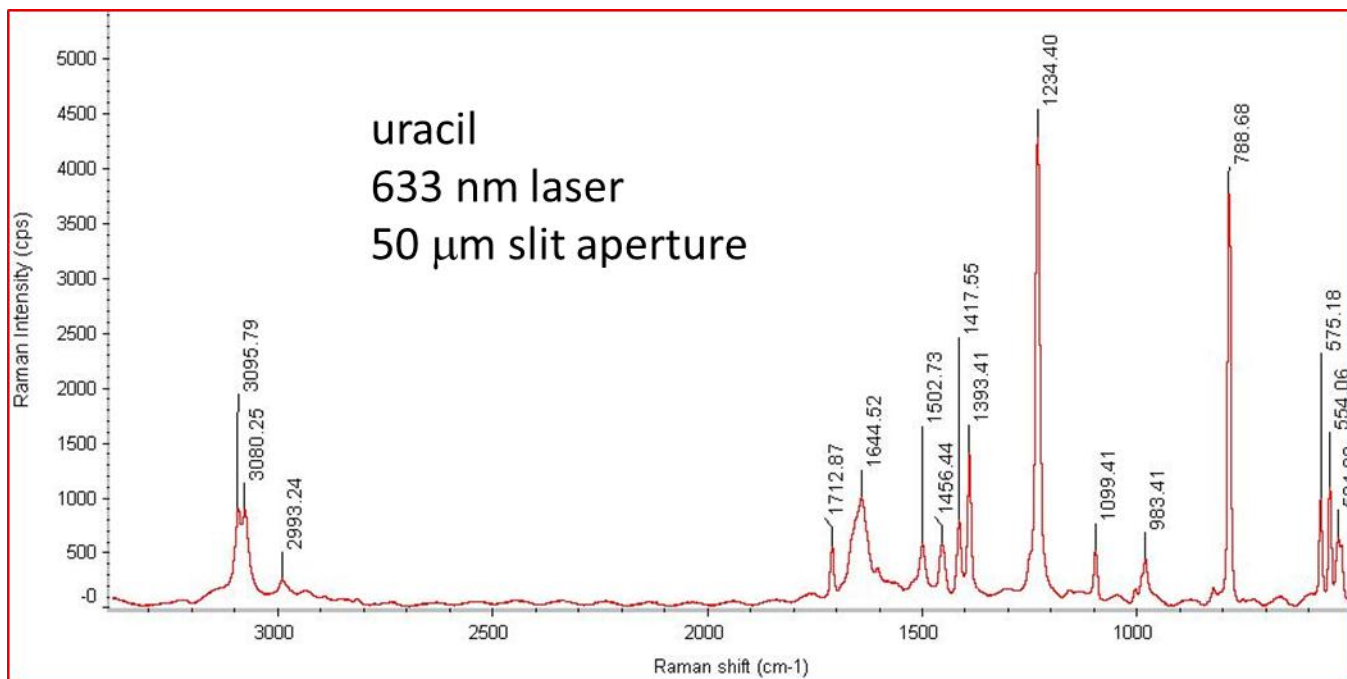


## Raman Spectroscopy

### • Other Compounds

uracil

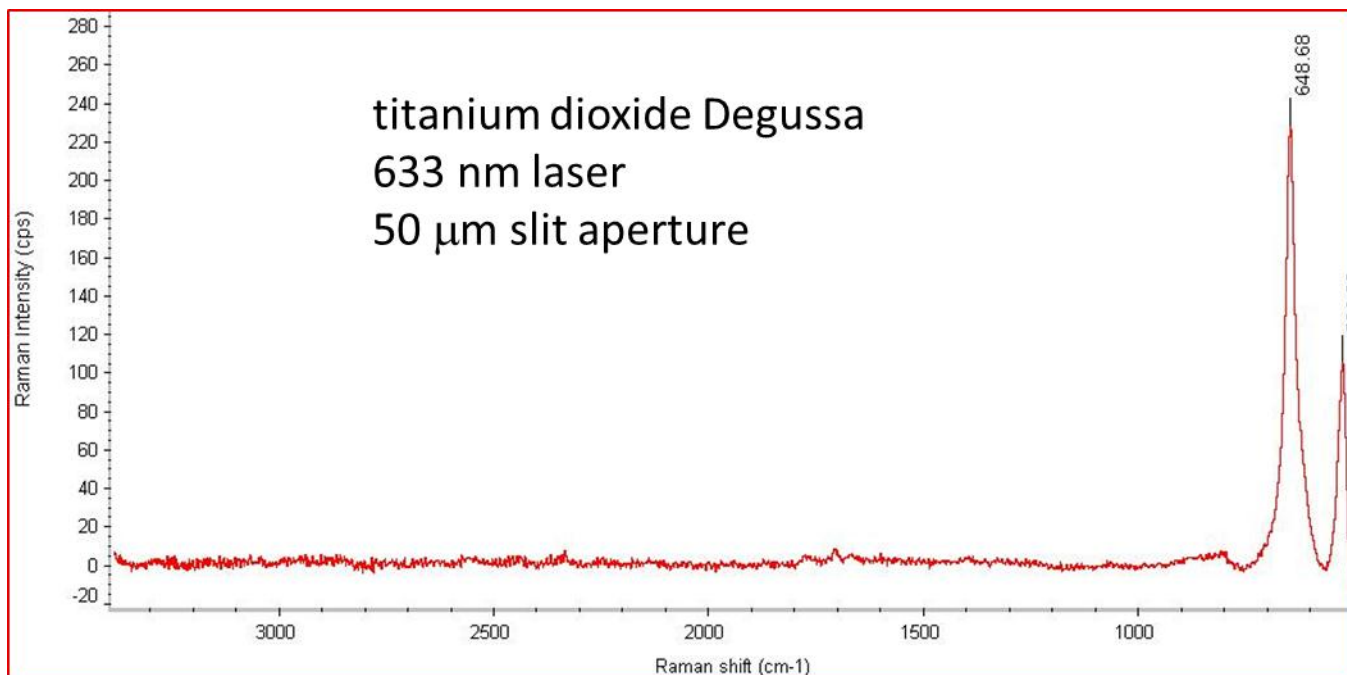
uric acid



## Raman Spectroscopy

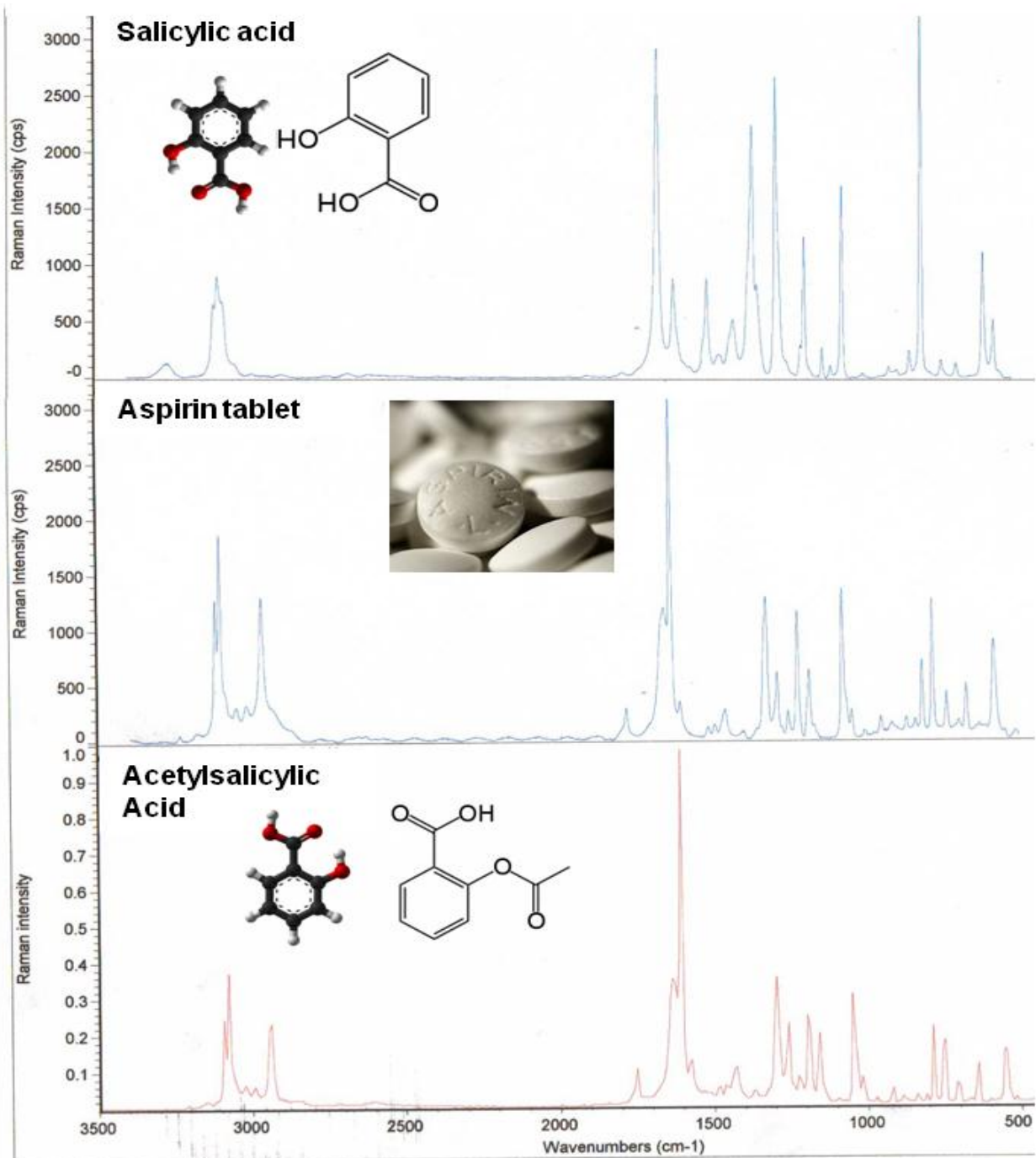
- **Other Compounds**

titanium dioxide nanoparticles, 15 nm diameter.



## Raman spectroscopy

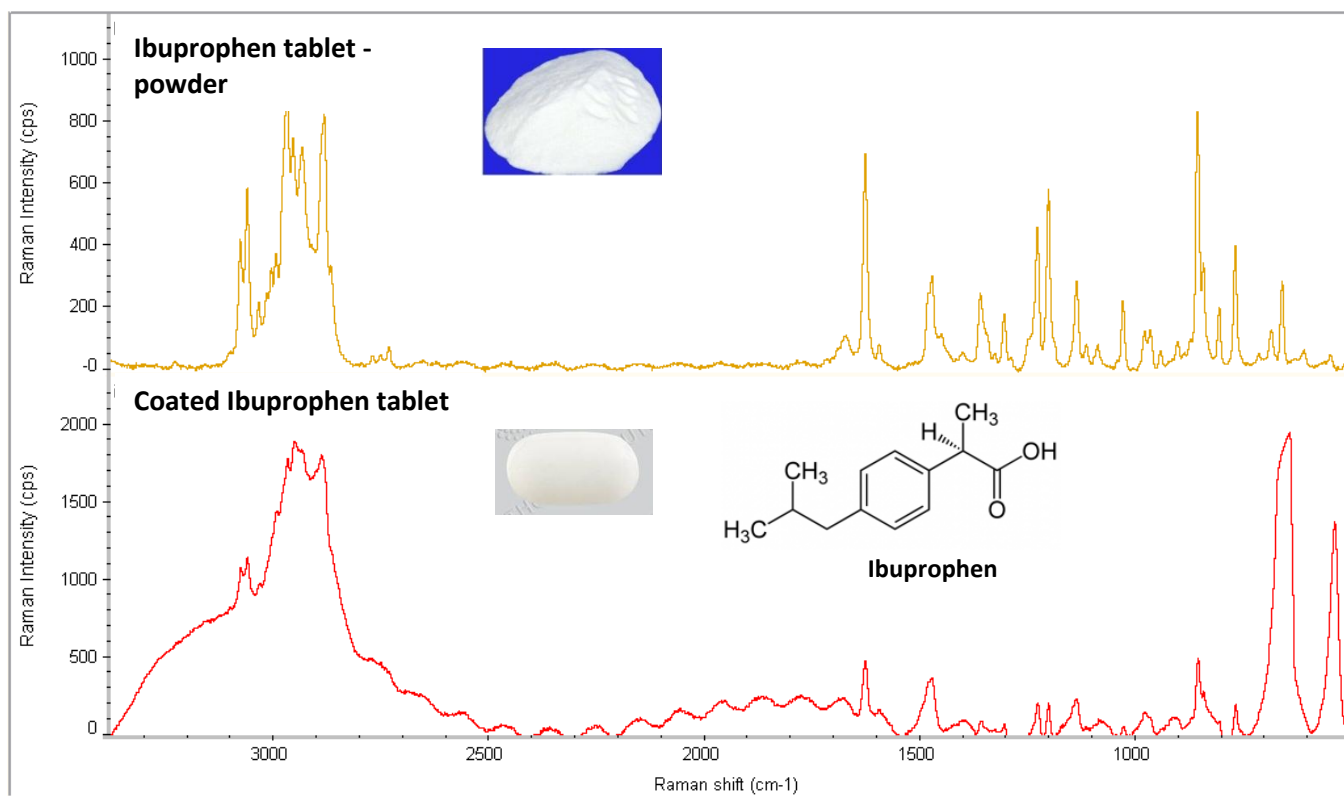
- Drugs





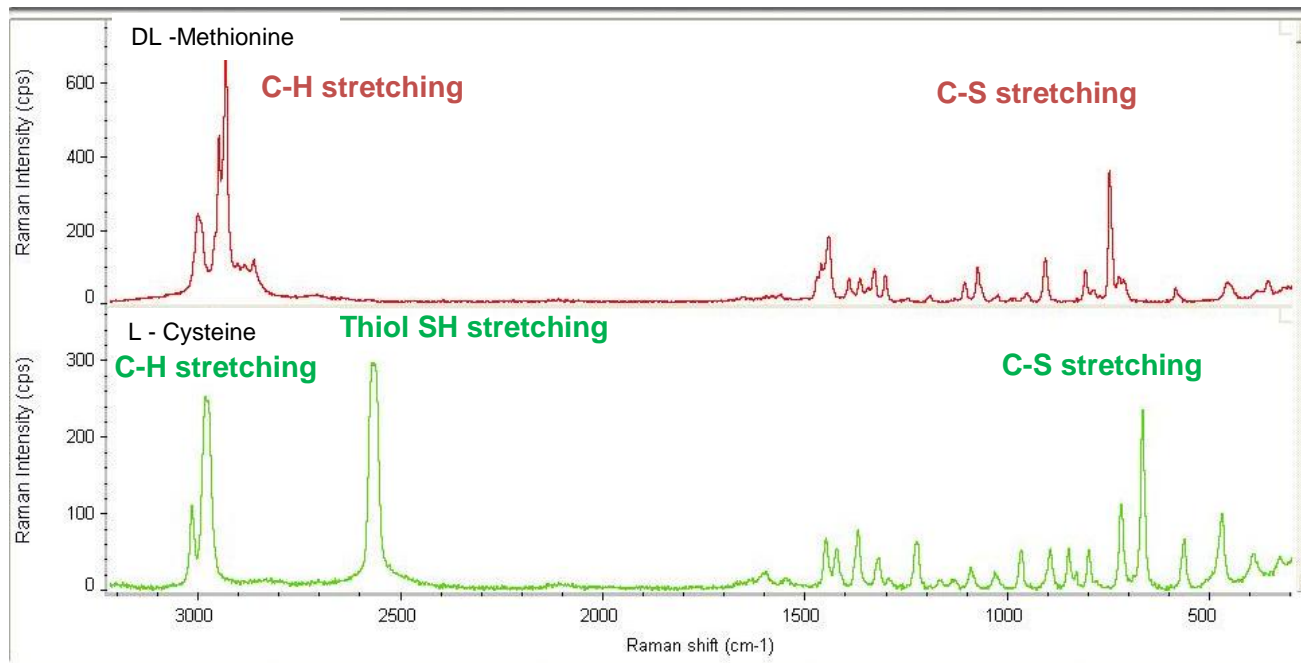
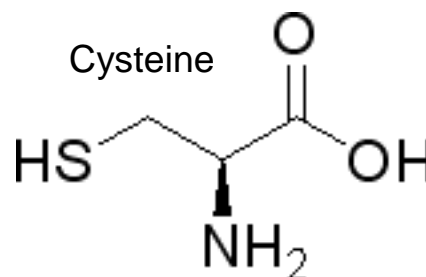
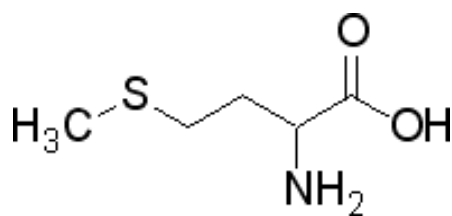
## Raman spectroscopy

### Drugs (cont.)

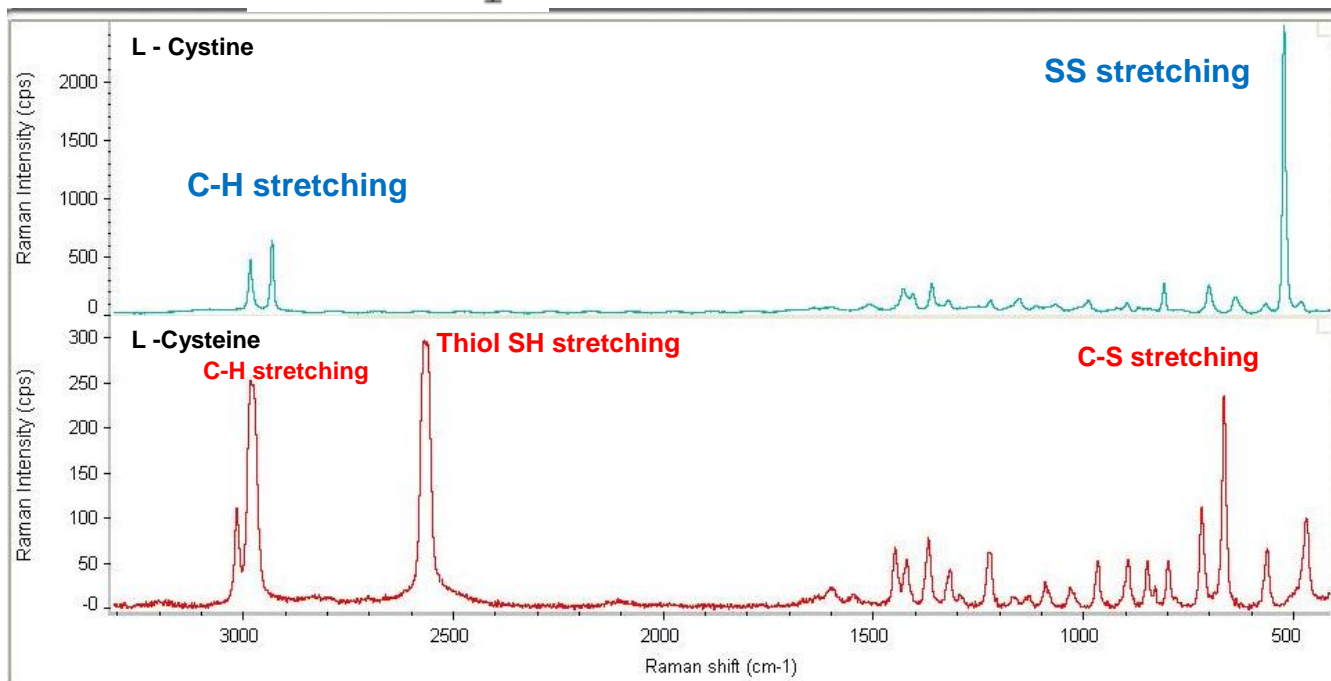
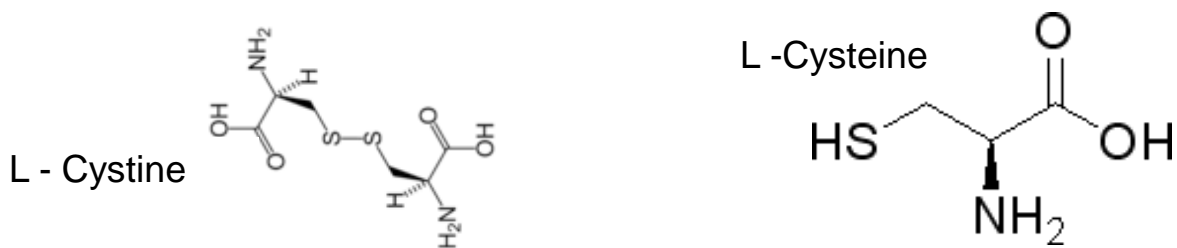


## Raman spectroscopy

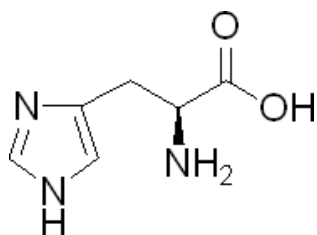
- Amino Acids



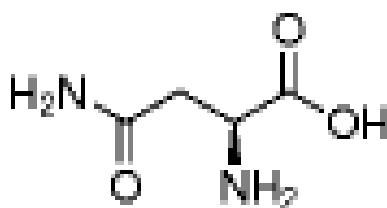
## Raman spectroscopy



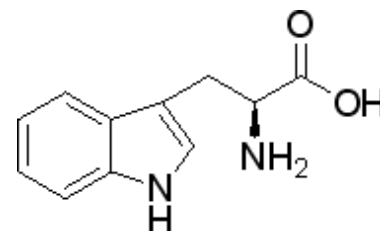
## Raman spectroscopy



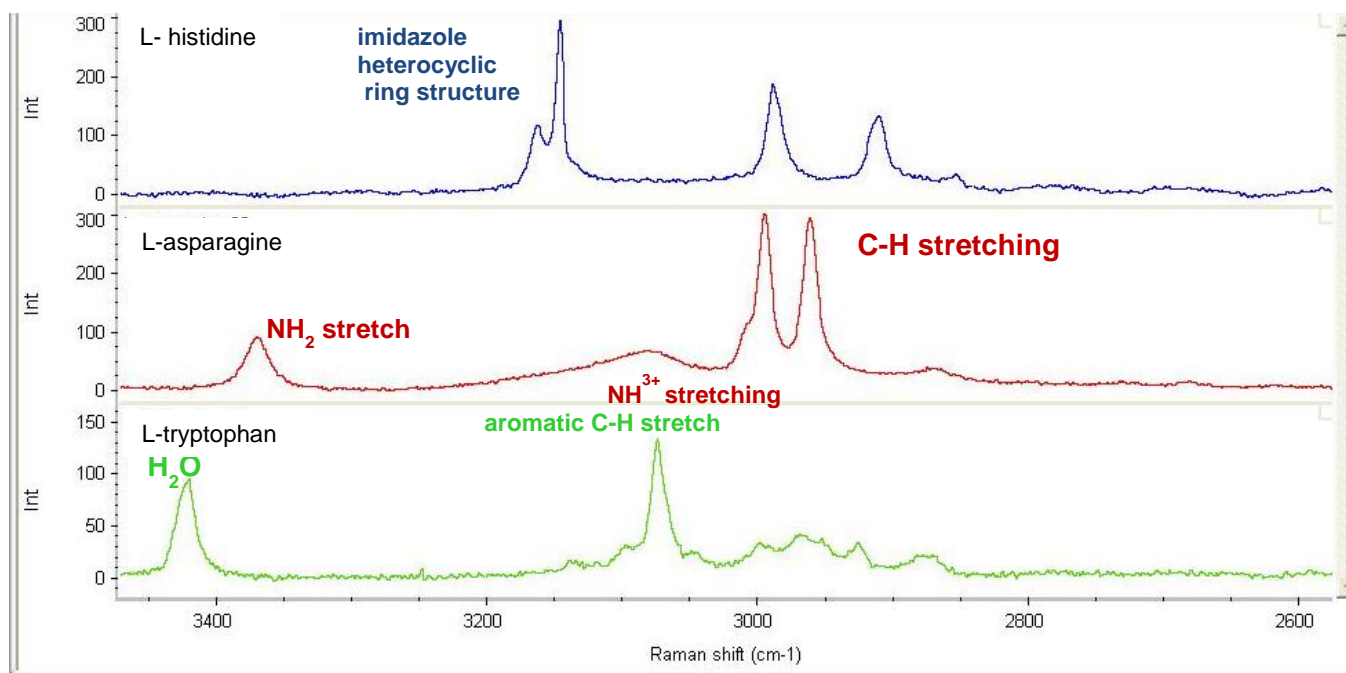
L-histidine



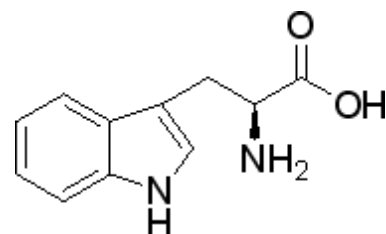
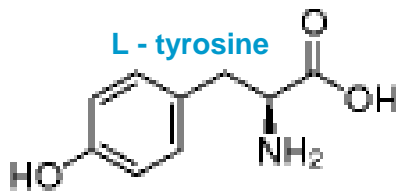
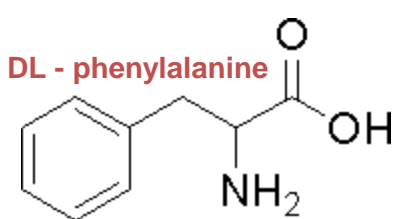
L-asparagine



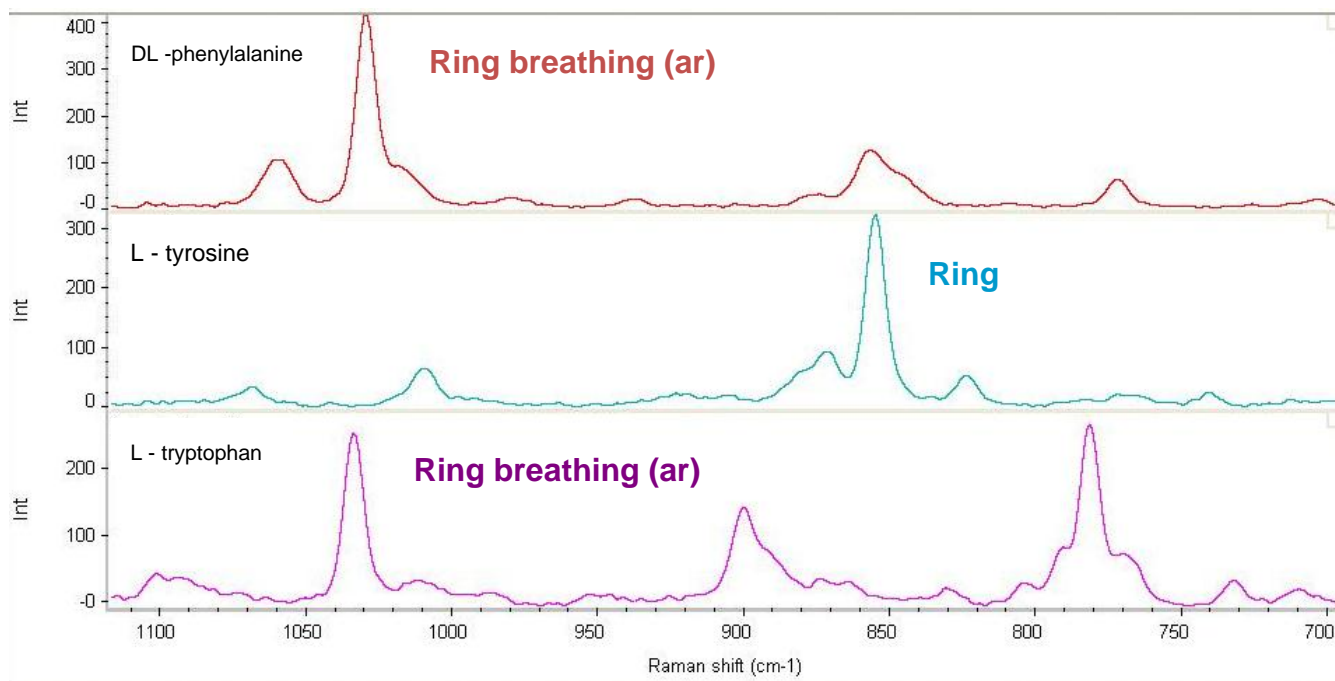
L-tryptophan



## Raman spectroscopy

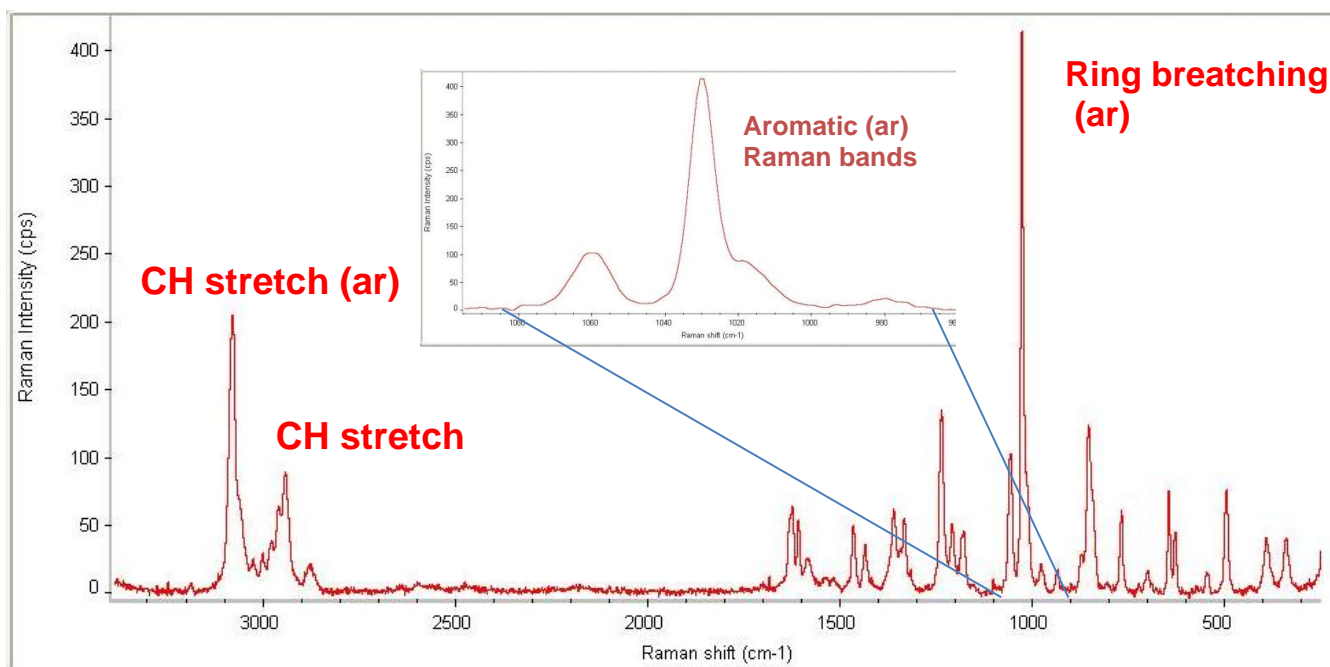
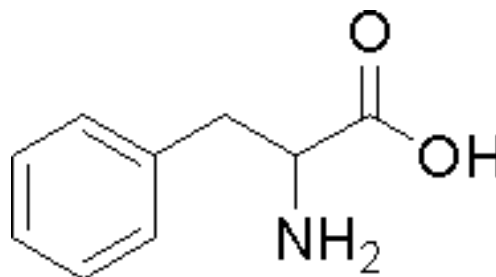


L - tryptophan



## Raman spectroscopy

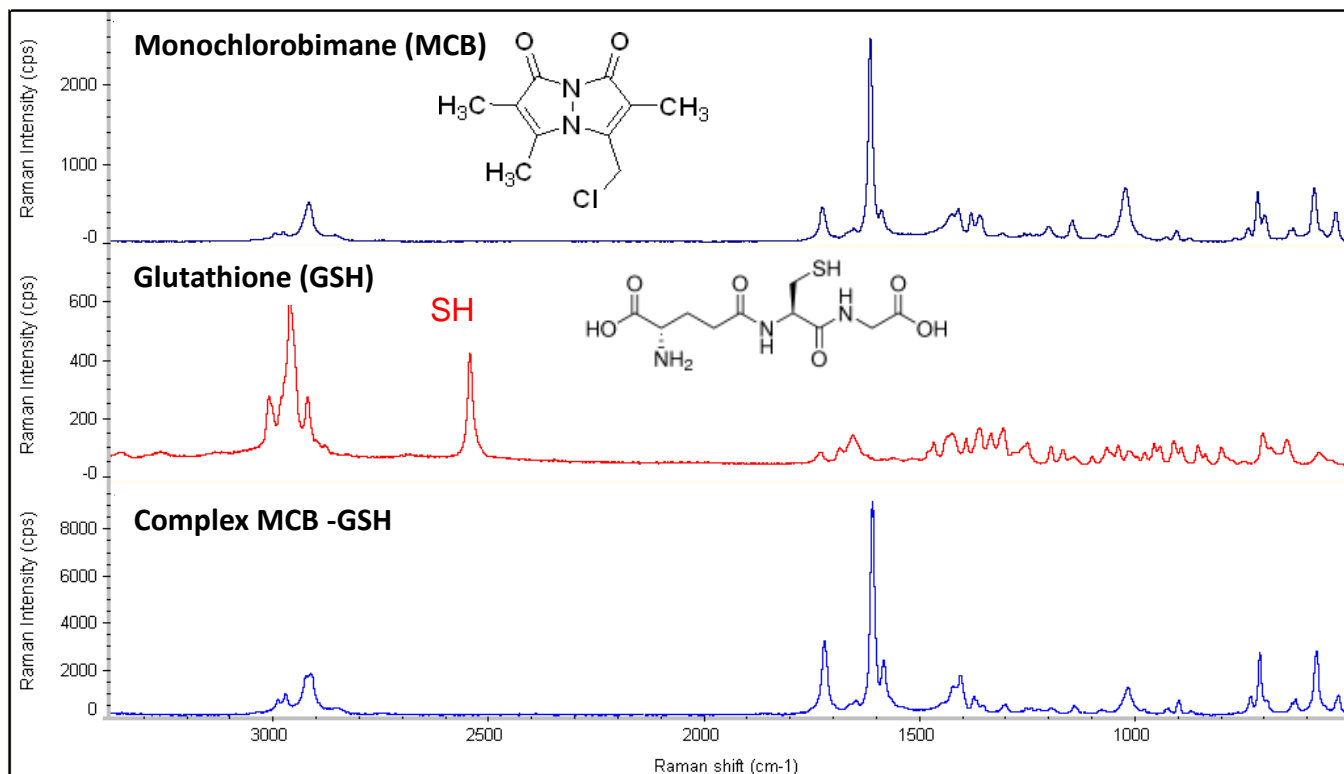
DL-phenylalanine





## Raman spectroscopy

- Molecular Interactions

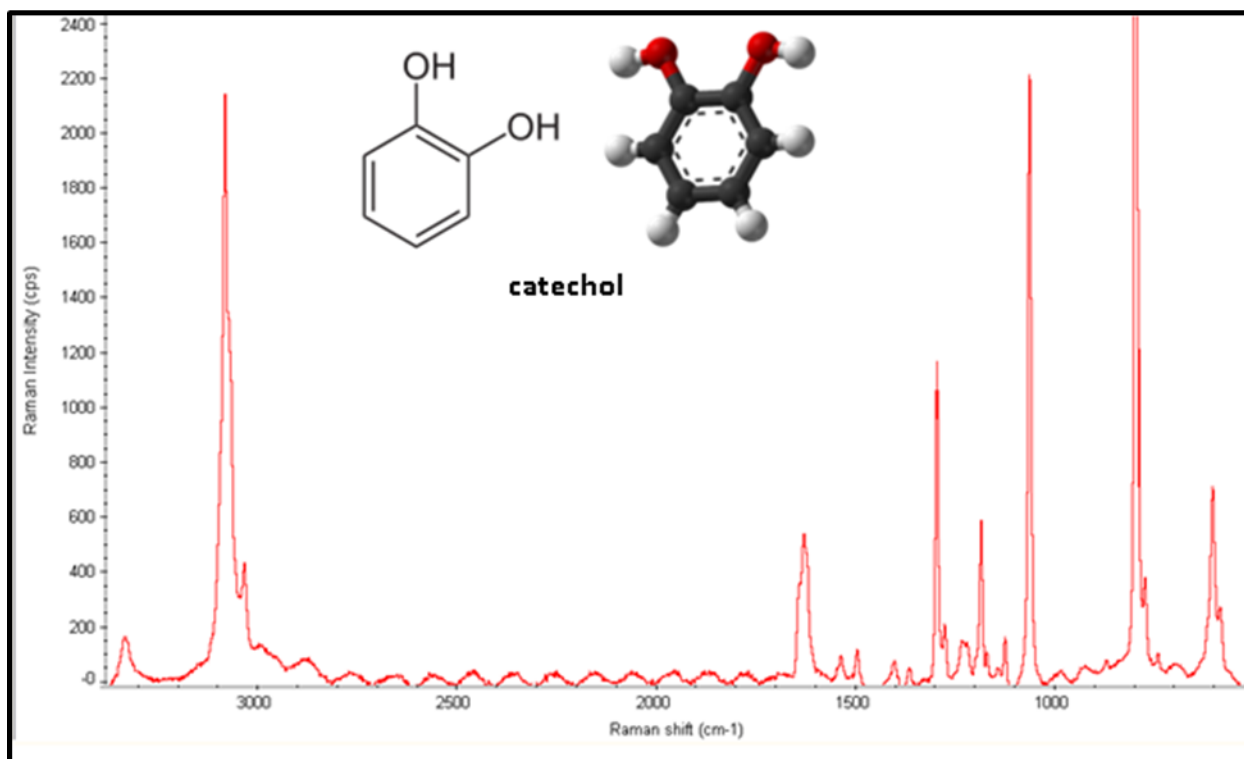


Binding of MCB to GSH  
Binding through S-atom is evident by the  
disappearance of the sharp SH vibration peak

## Raman Spectroscopy

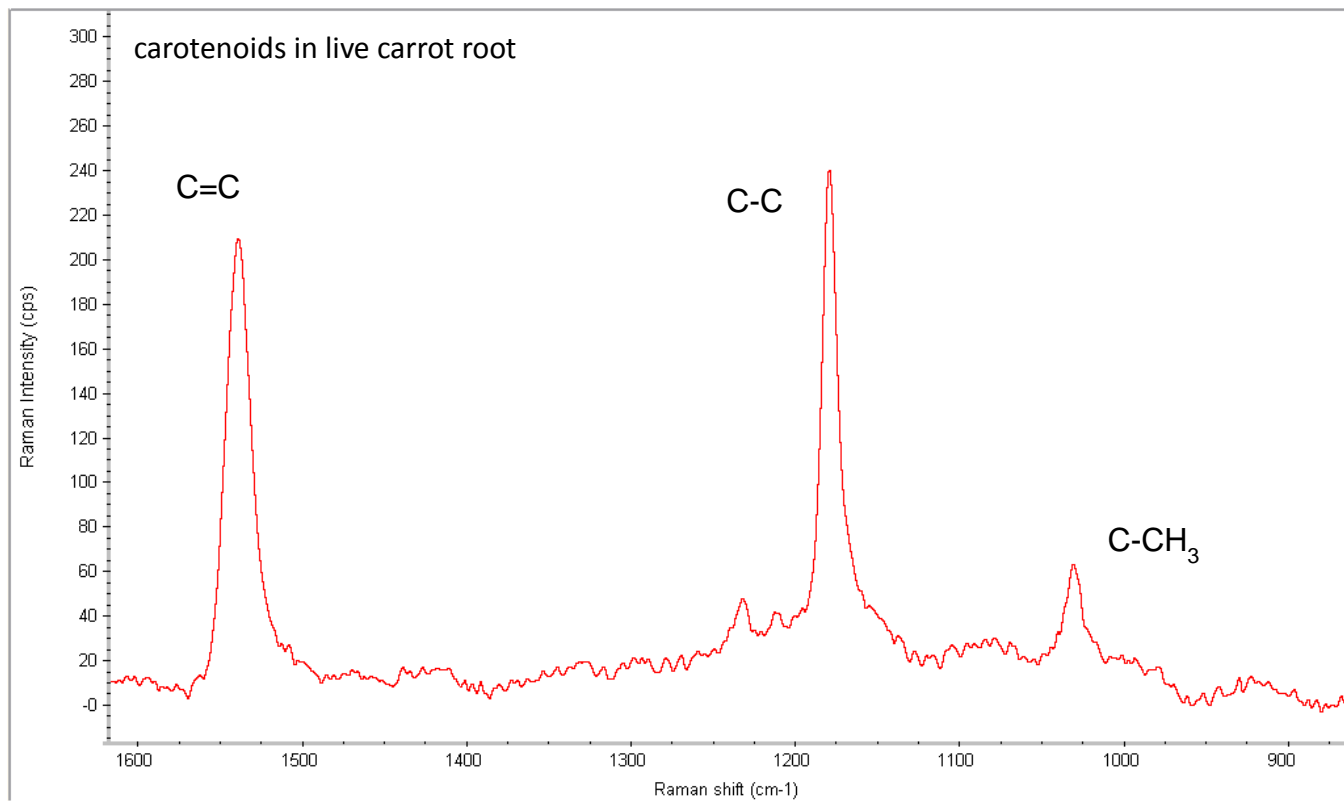
### Catechol

participates in oxidative DNA damage  
by ROS in the presence of Fe and Cu ions

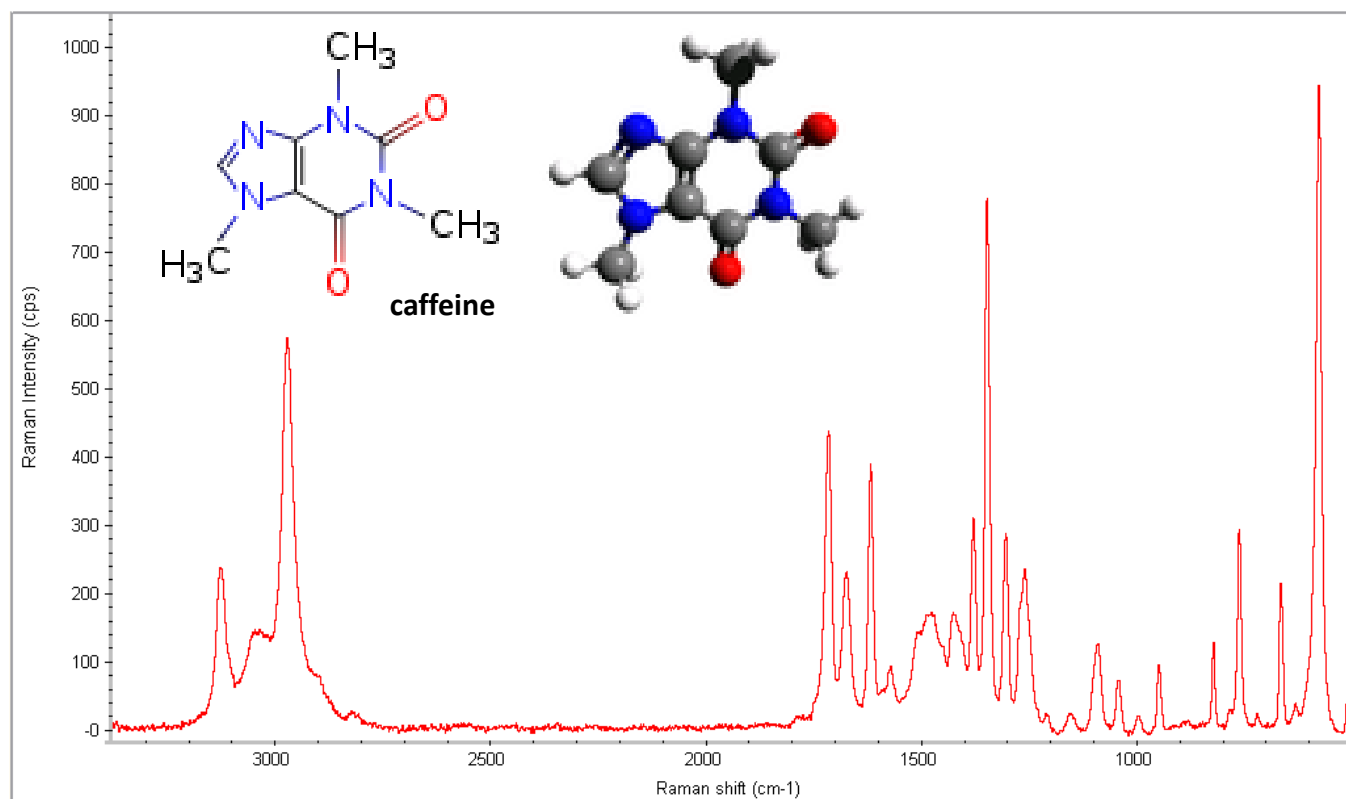


## Raman spectroscopy

- Food Sample

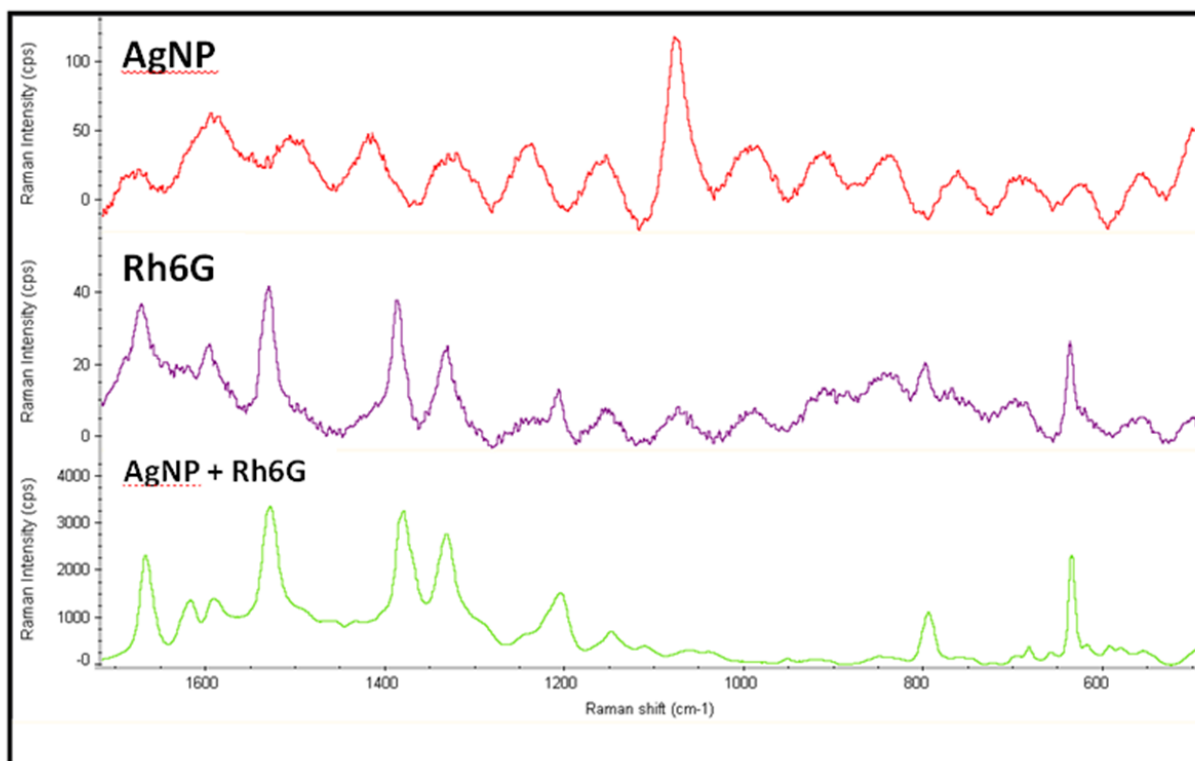
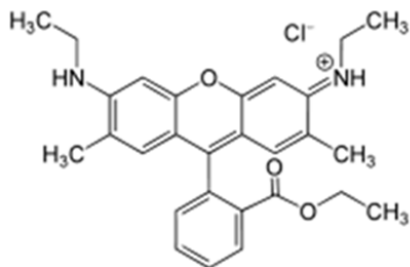


## Raman spectroscopy



## Surface Enhanced Raman Spectroscopy (SERS)

### Rhodamine 6G



NSF Grant No. CCLI-0941-364

PI: Professor M. Hepel  
SUNY Potsdam

## Raman Spectra

- Sugars

D-xylose

D-fructose

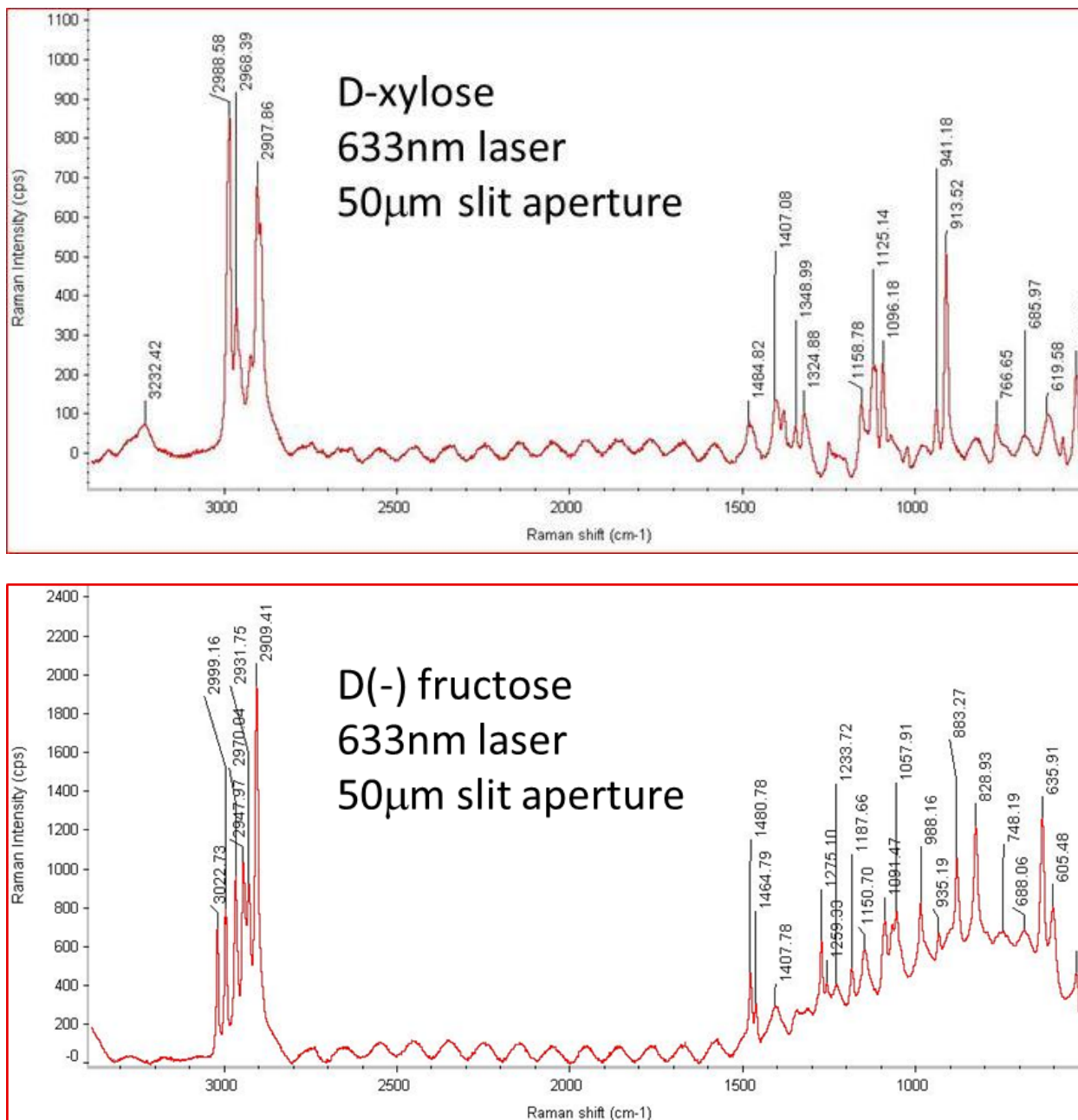


Fig. 1-2. Raman spectra of D-xylose and D-fructose.



## Raman Spectra

- Sugars

galactose

potato starch

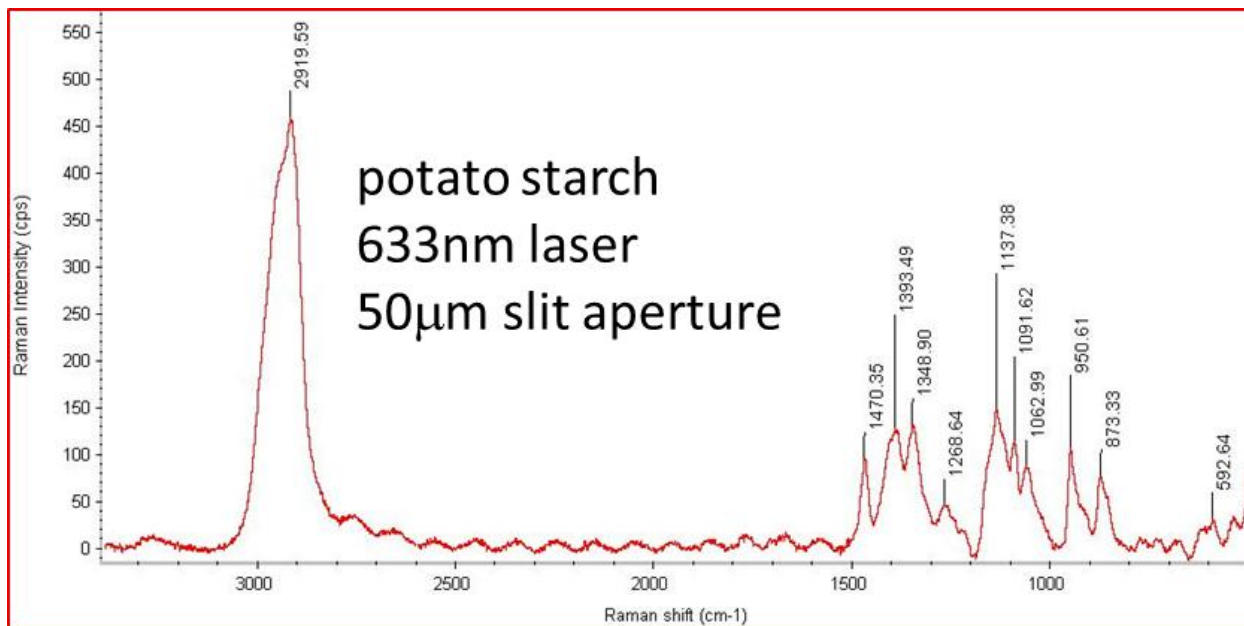
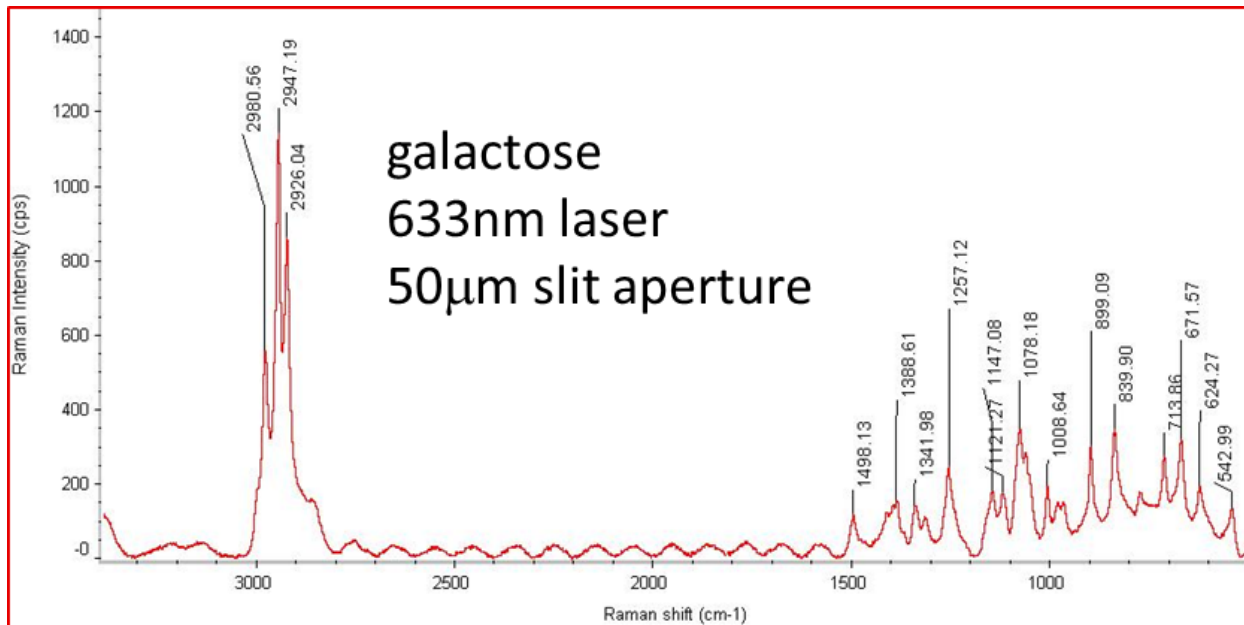
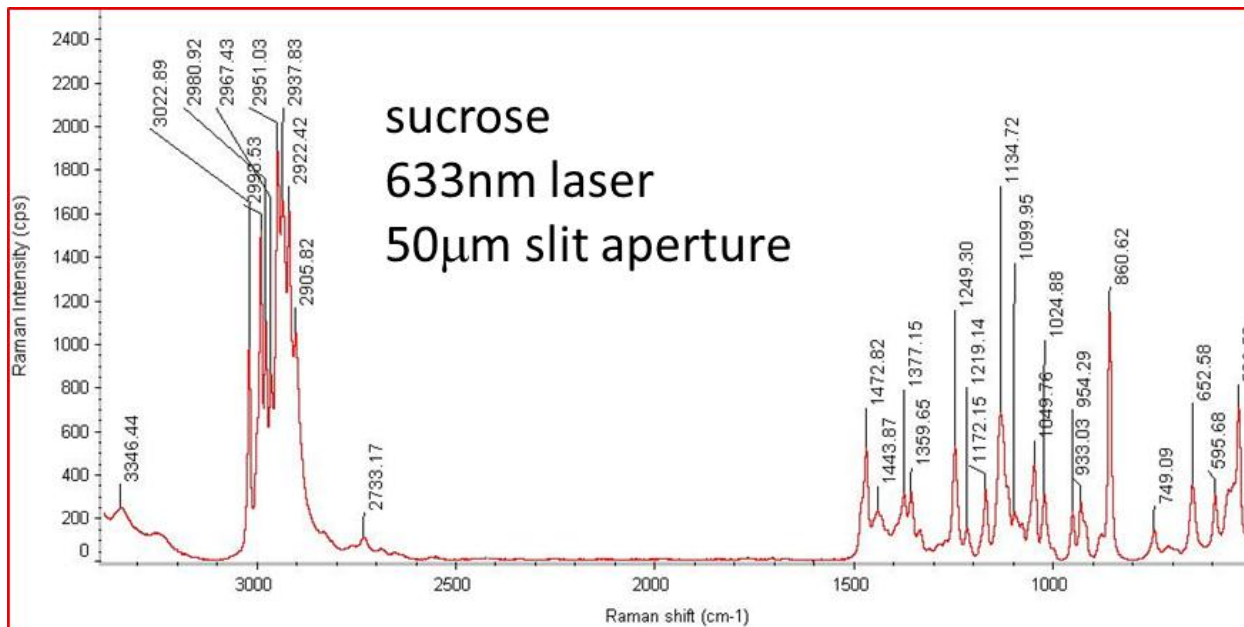


Fig. 3-4. Raman spectra of galactose and potato starch.

## Raman Spectra

- Sugars

sucrose

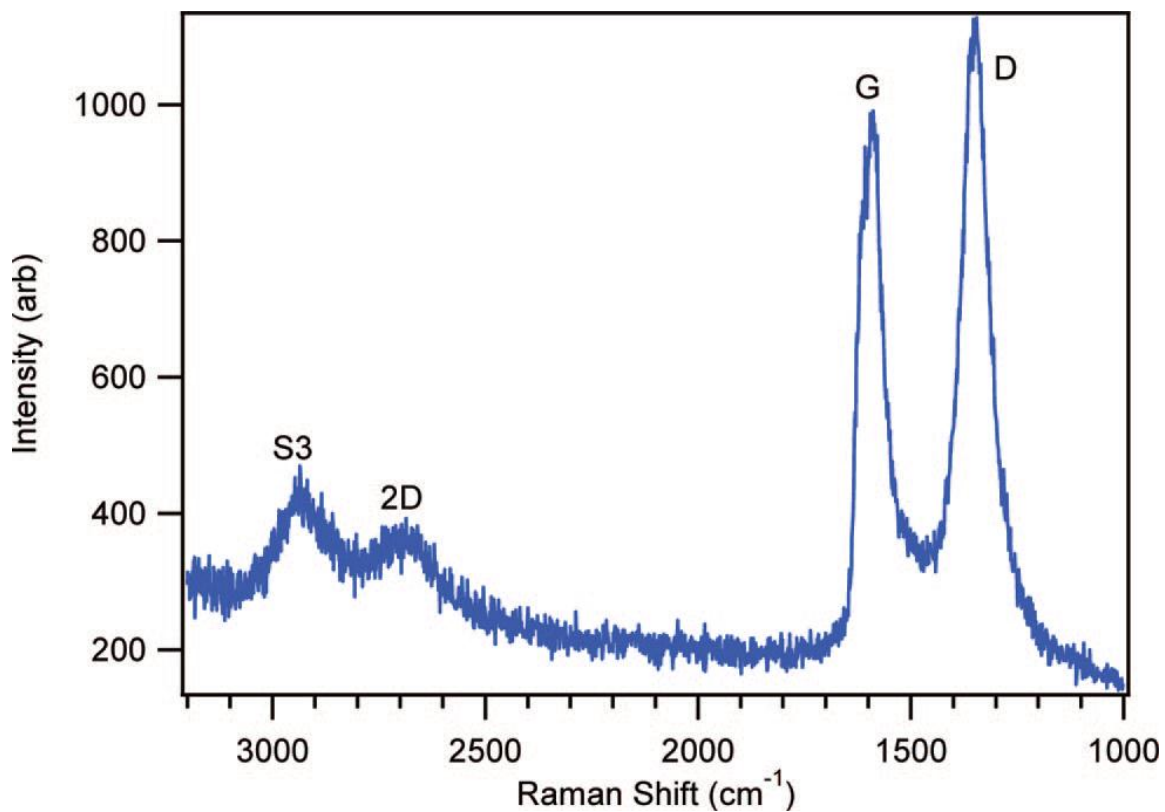


**Fig. 5.** Raman spectrum of sucrose.

## Raman Spectra

- Graphene

Single-layer graphene



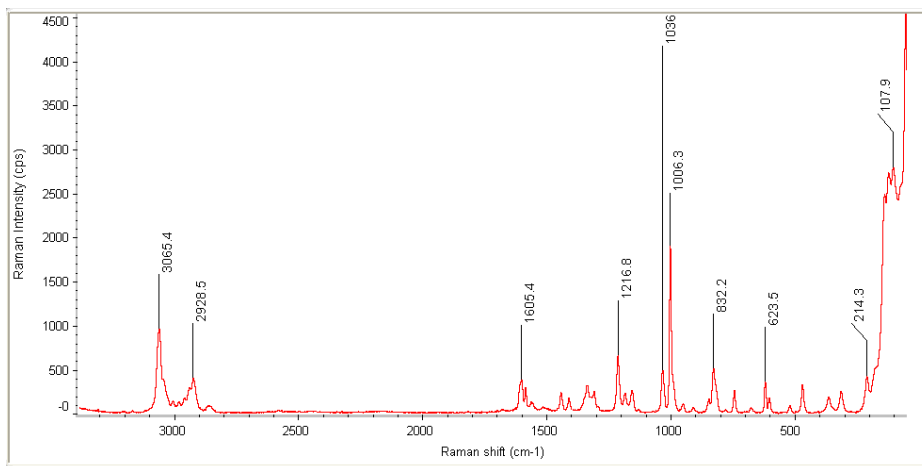
**Figure 6.** Raman spectrum of the single-layer graphene film deposited on a sensor surface.

## Raman Spectra

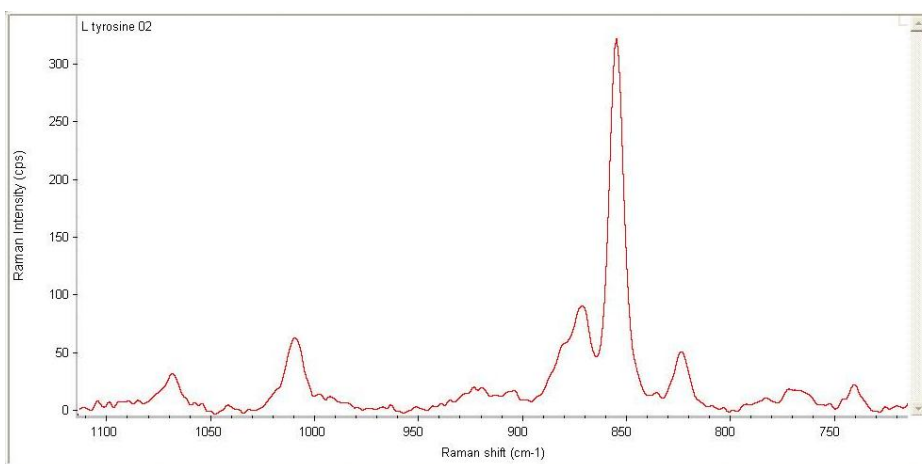
- Amino acids

phenyl alanine

tyrosine



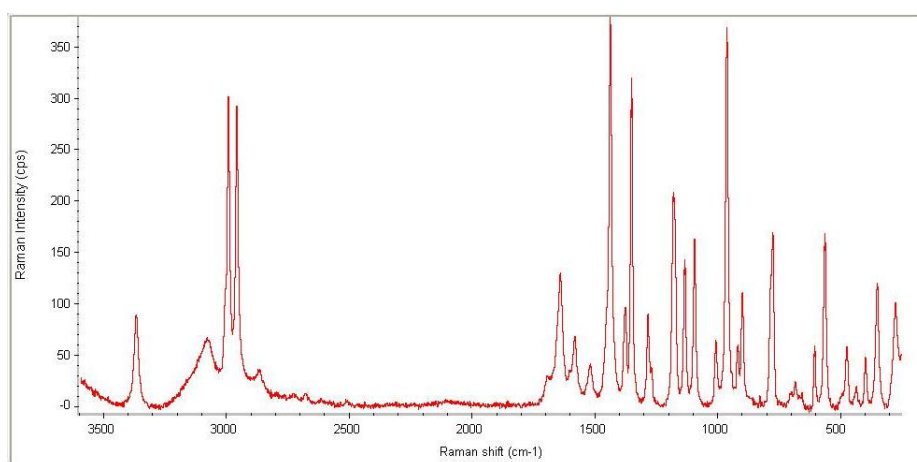
**Fig. 7.** Raman spectrum of phenyl alanine, laser: 633 nm.



**Fig. 8.** Raman spectrum of tyrosine, laser: 633 nm.

## Raman Spectra

- Amino acids  
asparagine



**Fig. 9.** Raman spectrum of asparagine, laser: 633 nm.