Tunable UV Resonant Raman Scattering: a powerful way to investigate the chemical and structural conformation of peptides, proteins, nucleic acids, carbonaceous systems and organic semiconductors

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Raman spectroscopy is an ideal system to study the behaviour of important bio-molecules, such e.g. proteins, DNA and bio-polymers. Through an accurate analysis of the Raman vibrational spectra it is possible to trace both the chemical and the structural conformation of a specific molecule. However, with extended macromolecules the superposition in the overall Raman spectrum of many vibrational components coming from several functional groups makes difficult the spectral interpretation. To overcome this problem, it is possible to exploit UV Resonant Raman spectroscopy (UVRR). In the UVRR scattering the excitation source corresponds to the energy required to get a π-π* electronic transition within a specific functional group. As a consequence, the Raman peaks coming from these functional groups are enhanced with respect to the further and it results in the final UVRR spectrum that contains only few selected vibrational peaks. With an appropriate choice on the excitation wavelength, it is possible to selectively enhance the vibrational features coming from specific functional groups, which can be therefore investigated more accurately. In the lesson will be illustrated how UVRR, in combination with FTIR, can provide a complete chemical and structural characterization of DNA extracted from cells, as well as determining variations in the tertiary structure in proteins of biomedical interest. Furthermore, it will be shown how the use of UVRR contributed, in combination with spontaneous Raman, FTIR and NMR, to infer about the chemical composition of highly conjugated polymeric systems, carbonaceous materials and organic semiconductors devices.

References:

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