

Portable Raman Spectroscopy for Biomedical Diagnostics and Trace Analysis

Raman spectroscopy is becoming more pervasive in biomedical diagnostics because of the demand for near real time and minimally invasive analysis at the point of care. Raman is an ideal technique for molecular fingerprinting and is sensitive to the chemical changes associated with disease.

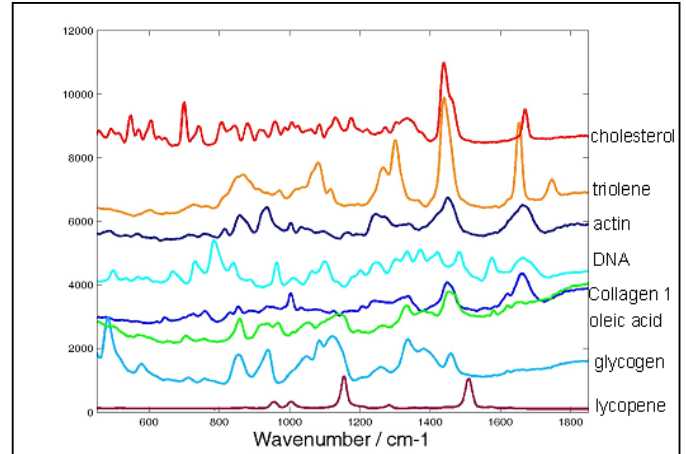
Applications of Raman include:

- Biopsies for analysis of tissue sample abnormalities
- Cytology investigations at the cellular level
- Drug efficacy studies
- Identification of biomarkers for early stage disease detection i.e. cancer, tuberculosis
- Surgical targets and treatment monitoring

Surface Enhanced Raman (SERS) provides signal enhancement of up to 10^6 and can aid in trace level detection.

There are a number of important functional groups related to biomedical testing, which have characteristic Raman frequencies. Tissue samples include Raman-active components such as lipids, fatty acids and protein. The most significant Raman spectral regions for the related molecular vibrations include:

- X-H Bonds (e.g. C-H stretches): $4000-2500\text{ cm}^{-1}$ region
- Triple Bonds (e.g. $\text{N} \equiv \text{C}$): $2500-2000\text{ cm}^{-1}$ region
- Double Bonds (e.g. $\text{C}=\text{C}$, $\text{N}=\text{C}$): $2000-1500\text{ cm}^{-1}$ region
- Complex Patterns (e.g. C-O; C-N and bands in the fingerprint region): $1500-600\text{ cm}^{-1}$ region



i-Raman® Series Set-Up for Applications in Biomedical Analysis and Trace Analysis

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To perform high quality measurements for these applications, you will need:

- i-Raman Prime 785S which includes trigger lab grade probe (532 and 1064 nm options also available)
- Video microscope with XYZ stage
- BWIQ quantitative analysis software
- SERS substrates (TacPac-P™ and other options)