

Raman Spectrometer Application

Application Area	Examples
Bioscience and Medical Diagnosis	<p>Subtle changes within biomolecules, such as drug interactions, tissue healing, cosmetics, disease diagnosis</p> <p>Intercellular SERS localization and interaction. Identification of drug binding to cells for Drug-DNA and cellular interaction analysis</p> <p>Investigation of microorganisms in single cells; yeast cell classifications, single bacterium</p> <p>Oxygenation measurements of blood and tissue</p> <p>Molecular level cancer detection (cervical, lung, etc.)</p> <p>Cardiovascular disease diagnosis (atherosclerosis)</p>
Pharmaceutical Industry	<p>Analysis of tablets, liquids, and gel caps</p> <p>High throughput screening techniques</p> <p>Crystallization, end point detection</p> <p>Process Analytical Technology (PAT) on-line, at-line monitoring and control: real-time monitoring of drying, coating, and blending</p> <p>Identification and analysis of API, additives and excipients</p> <p>Drug identification control device: Purity and Quality</p> <p>Raw material inspection: 100% incoming material identification & verification</p>
Raman Microscopy	<p>Pharmaceutical drug analysis: micro-Raman and localized molecular species analysis in complex drug mixtures such as beta-carotene in multivitamins</p> <p>Material science thin film analysis e.g. diamond film quality characterization</p> <p>Trace forensic evidence analysis, including fibers, fabrics, pigments, inks, etc.</p>
Polymers and Chemical Processes	<p>Quality Control: Incoming/Outgoing</p> <p>Identification of contaminants during manufacturing</p> <p>Real time monitoring of polymerization</p> <p>Predicting the morphological properties of polymers</p> <p>Multivariate Analysis/Chemometrics to predict physical properties: glass transition temperature, crystallization temperature, etc.</p> <p>Chemical composition analysis</p>
Forensic Analysis	<p>Nondestructive drug and narcotic drug identification</p> <p>Explosives: exact chemical compositions of materials, PETN, RDX and binding agents within explosive materials</p> <p>Identification and analysis of toxic solvents and bio-warfare agents</p> <p>Trace forensic evidence analysis, including fibers, fabrics, pigments, inks, etc., by Raman microscopy</p>
Gemology	<p>Non-invasive gemstone identification and examination</p> <p>Identify unknown gemstone by unique Raman signal</p> <p>Identification of isomorph or subspecies of gemstone</p> <p>Analysis of gemstone origin through Raman microscopy</p> <p>Anti-counterfeiting, such as identification of diamond from zircon</p>
Geology and Mineralogy	<p>Identification of geological materials</p> <p>Examination of inclusions in minerals</p> <p>Analysis of cement clinker by Raman microscopy</p> <p>Ancient fossil analysis</p>

Food and Agriculture	Measuring the unsaturated fatty acid in food oils Detecting bacteria and/or contaminants in food products Identification of additive drugs: nutraceuticals in fruit drinks Analysis of components in grain kernel
Environmental Science	Water pollution detection using SERS technology Identification of contaminants in water Petrochemical analysis Identification and analysis of sediments in water
Semiconductor and Solar	Characterization of silicon crystallinity: Monitoring of the Raman band shift as silicon crystallinity changes from amorphous to a polycrystalline structure Analysis of micron sized particles in situ to provide information on potential contamination Mechanical stress monitoring for semiconductor process



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