

# Raman Spectroscopy: An Emerging Analyzer Tool for the Pharmaceutical Industry

Summary: From discovery through production, Raman spectroscopy provides real time analytical data.

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For the majority of the 73 years since the discovery of the Raman effect, Raman spectroscopy has been cloaked with the mantle of a purely academic technique. Since the early 1990's, Raman spectroscopy has shed this image and emerged as an inherently powerful analytical technique, because every organic and inorganic chemical species gives rise to a distinct Raman spectrum.

The pharmaceutical industry is currently undergoing a revolution, epitomized by the term "high throughput." This includes the massive impact of genomic and micro-array technologies for discovery, as well as increased levels of automation and parallel processing at all stages of drug candidate material development. With these high throughput changes, the rate determining step in the drug development process is now the analytical measurement, rather than the actual chemistry.

In this regard, Raman is uniquely positioned to meet the present and future needs of the pharmaceutical industry. In addition to the advantages of non-contact measurements, mixed phase diagnostics and real-time data analysis, Raman is a technique that can be equally useful at all stages of the drug development cycle and in addition, provide benefit as an on-line analyzer when the successful drug candidate has advanced to the manufacturing stage.

In this presentation, we will review the advantages of Raman spectroscopy and examines the developments that have lead to its adoption by the pharmaceutical industry from the discovery / high throughput screening phase through the many stages of process development and optimisation to manufacturing and ultimately to QC testing. A limited number of pharmaceutically relevant Raman applications will be highlighted such as, Polymorphism and Crystallization, Grignard Reactions, Catalytic Hydrogenation.