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Development of Imaging Raman Spectroscope Equipped with Acousto-Optic Tunable Filter

Masaki Enami[1*], Hiroyuki Kagi[2], Masanori Sunose[3], Tomoyuki Mizukami[4]

[1]Nagoya Univ., [2]Univ. of Tokyo, [3]Seki Technotron Corp., [4]Kanazawa Univ.

Micro-Raman spectroscopy is a powerful technique for the detection of minute inclusions in optically transparent host phases. This technique enables the (1) identification of high-pressure phases included in diamond, zircon, and other containers, (2) estimation of chemical compositions of solid and fluid inclusions, and (3) measurement of residual pressures preserved by solid and fluid inclusions.

Recently, a micro-Raman spectroscope equipped with a motorized XY-translatable stage has received a lot of attention as a new imaging apparatus to acquire two-dimensional image maps of large regions in the interior of a sample. However, the map is usually produced by sequential scanning in a grid pattern in the XY plane, which commonly requires prolonged analysis extending up to several tens of hours.

A new conceptual imaging Raman spectroscopy system (STR Raman IMG) is under development. This system is designed to obtain snapshots of two-dimensional image maps of a sample within a relatively short time (ten to several tens of seconds). This system mainly consists of an acousto-optic tunable filter (AOTF: Brimrose Co.; CVA200-0.53-0.65-H; effective wavelength range: 530? 650 nm; space resolution: 1280 X 960 pixels), a cooled CCD camera (Andor Co.; DU9347-BV; pixel size: 13 micrometer^2; effective pixels: 1024 X 1024), a polarization microscope (Olympus Co.; BX-51), a motorized XY-translatable stage (Ludl Co.; Mac6000), and a DPSS laser (Laser Quantum Co.; Ventus HP532; wavelength: 532 nm; maximum power: 1.5 W).

Details of the Raman imaging system are described. The results of initial studies of diamond and some other minerals using the Raman imaging system will be also discussed.

Keywords: Raman imaging, Acousto-Optic Tunable Filter, AOTF