A Raman microscope with Snapht Dual Polarization capability

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Raman microscopy is a technique that provides structural and chemical information with the spatial resolution of a confocal microscope. Part of this information is related to the polarization of the Raman scattered light for given laser excitation polarization. In conventional Raman microscopy, a polarization analyzer is used to measure only one Raman polarization. Recently, we demonstrated that a Raman spectrometer could be improved so as to measure simultaneously the Raman signal emitted with the same polarization as the exciting laser, and with the orthogonal polarization [1] (fig. 1-top).

![Fig. 1: (top) modified Raman spectrometer allowing dual polarization snapshot acquisition; (bottom) Polarized Raman spectrum of tert-butanol for a linearly polarized Raman excitation.](image)

We made our design insensitive to the polarization dependence of the grating efficiency over the 350nm to 1000nm wavelength range. To achieve this, we derived the necessary and sufficient condition for a polarization-balancing component inserted between the polarization separation and the grating, expressed as a constraint on coefficients of its Muelle matrix. This condition is found less restrictive than the well-known quarter waveplates or half waveplates commonly used for this purpose. It is useful to construct a simple wideband solution.

The performance of the dual polarization Raman microscope is illustrated by raman spectra on several materials (fig.1-bottom).