Infrared micro-spectral measurements of single cells: Characterisation and correction of spectral artefacts attributed to cellular morphology and anomalous dispersion

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Over the last decade there has been a significant increase in the use of infrared micro-spectroscopy to study and characterise single biological cells. The technique provides potent biochemical information that may be used to determine, for example, a cells anatomical origin or maturation, or whether it has been compromised at the molecular level by neoplasia or viral transfection. However, efforts to provide robust algorithms to classify infrared spectral data collected from individual cells is reliant upon the extraction of a pure absorption spectrum from a raw measured spectrum that may in some cases be contaminated by confounding spectral distortions. These artefacts may include a broad sinusoidal-like oscillation in the baseline of the spectrum attributable to a Mie-type scattering [1,2], and a distortion of band shapes, most notably a derivative-like distortion to the Amide I band, more recently characterised as a "resonant" Mie scattering effect [3].

This poster shall describe efforts within our laboratory to fully document the effect of a cells physical structure or morphology on a substrate to its recorded spectrum, and a strategy to correct non-chemical distortions to a spectrum by use of a combined Kramers-Kronig transformation and a subsequent scattering curve correction using Extended Multiplicative Signal Correction (EMSC).

References:

[1] B. Mohlenhoff, M. Romeo, M. Diem and B. R. Wood, *Biophysical Journal* 88, 3635–3640 (2005).

[2] A. Kohler, J.Sule-Suso, G. D. Sockalingum, M. Tobin, F. Bahrami, Y. Yang, J. Pijanka, P. Dumas, M. Cotte, D. G. van Pettius, G. Parkes and H. Martens, *Appli. Spectrosc.* 62, 259-266 (2008).

[3] P. Bassan, H. J. Byne, F. Bonnier, J. Lee, P. Dumas and P. Gardner, *Analyst* 134, 1586-1593 (2009).