



# Topical Research Meeting on Physics in Food Manufacturing

Session: Sensing, Imaging and Monitoring

## **Deep Raman Spectroscopy (DRS): A novel platform to non-invasively measure temperature deep within samples with chemical specificity**

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Classic thermal monitoring techniques such as thermocouples, require invasive contact with the sample, while other techniques such as infrared thermography are generally limited to providing temperature information at the sample surface. Moreover, the listed techniques lack chemical specificity in their temperature sensing capabilities. These limitations have been addressed with new developments in Deep Raman Spectroscopy (DRS), which have expanded the sampling capabilities of the technique. Classically Raman spectroscopy has been seen as a surface technique with diffusely scattering samples, and the spectra obtained have been limited to depths of  $<100\ \mu\text{m}$ , however with the development of DRS it is now possible to probe orders of magnitude further into a diffusely scattering samples.

We will present our recent work that not only demonstrates that chemical information can be measured at depth in turbid samples, but also the physical properties of the sample such as temperature. Thereby providing a non-invasive method with chemical specificity to monitor temperature at depth. This has been demonstrated in polymer systems as well as biological tissue mimics, demonstrating the potential broad application this development has.