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High-Resolution Macro ATR-FTIR Chemical Imaging Capability at Australian Synchrotron IR Beamline and Its Applications in Food Science

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This work presents advances in high-resolution chemical imaging capability at Australian Synchrotron Infrared (IR) beamline, achieved through the use of an in-house developed synchrotron macro ATR-FTIR microspectroscopic device **(1)**. The device was developed by modifying the cantilever arm of a standard macro-ATR unit to accept germanium (Ge) ATR elements with different contact facet sizes (i.e. 1 mm, 250 μm and 100 μm in diameter). Coupling synchrotron-IR beam to the Ge ATR element (n = 4) used in this device, has the effect of not only reducing the beam focus size (improving the lateral resolution) by a factor of 4, but also reducing the mapping step size by 4 times relative to the stage step motion. As a result, the macro ATR-FTIR measurement at Australian Synchrotron IR Beamline can be performed at minimum beam size of 1.9 μm using a 20x objective, and at minimum mapping step size of 250 nm, allowing high-resolution chemical imaging analysis. It can also be coupled to a temperature control unit, allowing temperature-dependent study, as well as measurements that require a fixed temperature such as analysis of dairy products at 4 oC similar to the usual storage condition in a household fridge.

The development of the macro ATR-FTIR device has so far led to successful analysis of samples from a diverse range of research disciplinary. Key applications in food science to be presented include a range of dairy products (e.g. cheese and yoghurt), microencapsulated oil **(2)**, plants and vegetables.

References

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Primary author(s) : Dr VONGSVIVUT, Jitraporn (Pimm) (Australian Synchrotron); Dr PAX, Anita (The University of Melbourne); Dr ONG, Lydia (The University of Melbourne); Dr SEKINE, Ryo (University of South Australia); Prof. LOMBI, Enzo (University of South Australia); Dr PRASAD TIMILSENA, Yakindra (RMIT University); Prof. ADHIKARI, Benu (RMIT University); Dr TOBIN, Mark (Australian Synchrotron)

Presenter(s) : Dr VONGSVIVUT, Jitraporn (Pimm) (Australian Synchrotron)

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