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Single Contact ATR Mapping of Soft Materials by Synchrotron FTIR

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Attenuated Total Reflection (ATR) is a sampling method frequently used for FTIR microanalysis of samples which cannot be prepared as thin sections for transmission analysis. Generally, an ATR prism is attached to the front of the microscope objective and 2D mapping achieved by repeated contacts with the ATR crystal. The method is more suited to harder materials, since the multiple ATR contacts may lead to damage of softer materials. We have developed ATR devices for the purpose of analysing softer materials, where only gentle contact can be made with the sample surface, in which the ATR crystal is attached to the microscope stage rather than the objective. Firstly, a modified micro-compression cell, in which a ZnSe ATR prism is brought gradually into contact with the surface of the sample, has been used to study the hydration water in chitosan-hyaluronic acid model biolubricant, as a function of pressure. As part of a study of the resistance of insect wings to biofilm formation, this ZnSe ATR has also been used to map the surface of structured fatty acid films being studied as an analogue to the dragonfly wing epicuticle, revealing the relative peak position of CH₂ absorption of a textured stearic acid film on graphite. More recently, an ATR device which employs more precise piezoelectric sample alignment and ATR contact control has been developed for further analysis of soft materials.

Keywords

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Primary author: Dr TOBIN, Mark (Australian Synchrotron)

Co-authors: Dr VONGSVIVUT, Jitraporn (Pimm) (Australian Synchrotron); Dr BAMBERY, Keith (Australian Synchrotron)

Presenter: Dr TOBIN, Mark (Australian Synchrotron)

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