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Raman spectroscopy of living biofilms in flowcells

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Abstract

Biofilms of *Pseudomonas aeruginosa* and *Pseudoaltermonas* sp. NCIMB 20221 have been grown in a flowcell in Raman confocal microscopes.

Signals from nucleic acids, proteins, carbohydrates and phosholipids can be distinguished in the spectra of the hydrated living cells. The confocal volume is equivalent to several bacteria.

Areas high in EPS are distinguished by the presence of pigment peaks which disappear when the biofilm is washed with ethanol. Cell rich areas were identified in young biofilms. The signals from phospholipids were particularly pronounced in biofilms grown in a minimal medium, but the characteristic peak at 1740 cm^{-1} was absent from the spectra of biofilms which were grown in artificial seawater. The biofilms grown in seawater also showed greater hydration and the biomass never reached the density found in biofilms grown in minimal growth media.

Single bacteria can be seen initiating biofilm formation, and the increase in EPS as biofilm grows can be followed and mapped.

Biography

Truis Smith-Palmer is a Professor of Analytical Chemistry at StFX and a member of the Centre for Biofouling Research. She has been involved in vibrational spectroscopy for many years, and in its applications to biofilm studies for the last ten years.