



第174回触媒化学研究センター談話会

演題：The Structure of Interfaces Studied by
Sum Frequency Generation(SFG)
Vibrational Spectroscopy

講演者：Dr. Paul Davies
(Department of Chemistry, University of
Cambridge, UK)

日時：2004年 11月 2日(火)
15:00 - 16:30

会場：北海道大学創成科学研究棟
4階 セミナー室B (04-214)号

講演内容：

The second order non-linear optical technique of Sum Frequency Generation(SFG) vibrational spectroscopy is being used to study molecular structure at various planar interfaces. In SFG two pulsed laser beams one in the infrared region and tuneable and the other a fixed frequency visible laser are overlapped spatially and temporally at solid/liquid or liquid/air or liquid/liquid interfaces. SFG spectra in the C-H stretching region at different interfaces will be described.

The SFG spectrum of the comb co-polymer cetyl dimethicone copolyol(CDC), which contains both polyethylene oxide(PEO) and cetyl side chains, has been recorded in air after deposition on a bare gold-coated substrate. The spectrum of CDC arises from the methyl groups of the polymer backbone and the cetyl side chains implying conformational ordering of these moieties. From the phase of the cetyl group vibrational resonances it is concluded that the alkyl chains point away from the surface and into air. The co-adsorption of surfactants and polymers onto hydrophobic surfaces from aqueous solution has been investigated for both charged and uncharged combinations. As expected the SFG spectra confirm enhanced adsorption of surfactant at the interface when surfactant and polymer are oppositely charged(due to electrostatic interaction)compared with adsorption in the absence of polymer.

Recently we have examined the weaker interaction in a classic charged surfactant-uncharged polymer system namely the anionic surfactant sodium dodecyl sulphate(SDS) and the(polar)polymer polyethylene oxide(PEO). The SFG spectra show that PEO is adsorbed in preference to SDS at low concentrations of surfactant but that the polymer is displaced at higher SDS concentrations.

Ultrathin organic films are essential components of many nanotechnologies. A large class of thin films are those constructed by Langmuir-Blodgett(LB) deposition. The SFG spectra of LB multilayer films consisting of the cadmium salts of long chain fatty acids deposited onto gold are currently being investigated. Through judicious incorporation of per-deuterated layers into the multilayer LB film it has been shown that the SFG signals arise from the topmost layer in contact with air and from the bottom layer in contact with the hydrophobic gold substrate. Furthermore it is possible to obtain the SF spectrum of a single buried layer within the film by incorporating a per-protonated layer in an otherwise per-deuterated multilayer. This has enabled SFG to be applied to the study of multilayer films incorporating cadmium sulphide nanoparticles.

《連絡先》北大触媒化学研究センター 界面分子化学分野

名前 大澤 雅俊 (TEL: 011-706-9126, FAX: 011-706-9124)