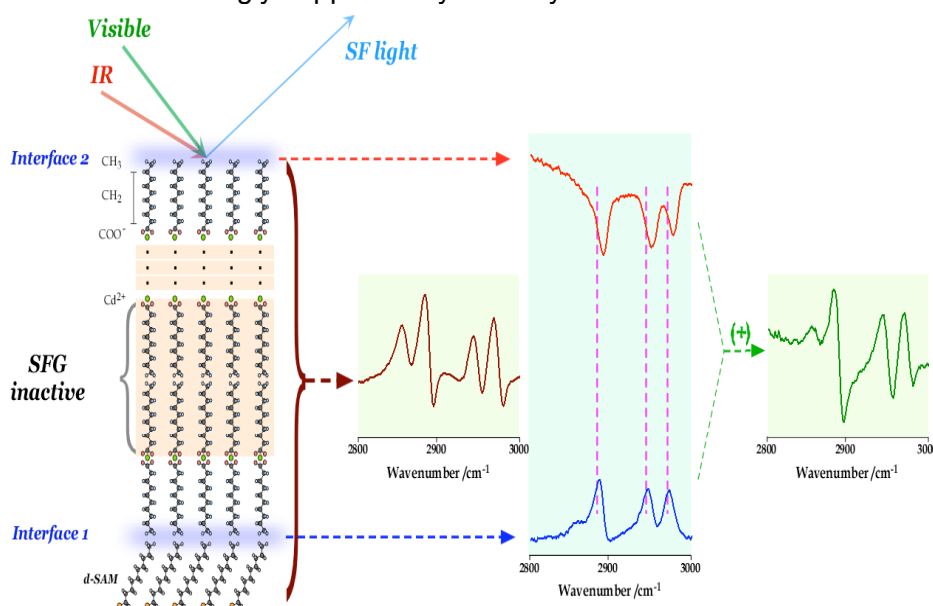


Laser Spectroscopy has revolutionised the determination of molecular structure. The Cambridge **Infrared Laser Spectroscopy Group** uses a variety of novel laser based techniques to study molecules in situations as diverse as low pressure electric discharges (plasmas) and on surfaces buried under liquids. The shapes of short lived molecules like free radicals and ions are precisely determined using solid state diode lasers in combination with sensitive, species-specific detection methods like Velocity Modulation. Recent diode laser spectroscopy of free radicals has included measurement of the band strength of the methyl radical, CH<sub>3</sub>. This is required for detection and density measurements of CH<sub>3</sub> in the atmospheres of the giant planets Saturn and Neptune. We are now enhancing the sensitivity of IR laser absorption spectroscopy in a fruitful collaboration with German colleagues using a Cavity Ring Down (CRD) spectrometer built around novel Quantum Cascade Lasers. The group is also heavily involved in non linear laser spectroscopy particularly the interface specific technique of Sum Frequency Generation (SFG). We use SFG to gain insight into adsorption at interfaces on a molecular scale e.g. of surfactants and polymers. We use nano and picosecond lasers for SFG in Cambridge and femtosecond SFG to quantify non linear optical effects in Langmuir Blodgett films in a joint project with co-workers in Hokkaido, Japan. The aim is eventually to use SFG to study biological systems like the lung surfactants. In addition to our international projects, which involve overseas visits by our research students, much of our work on surfaces and interfaces is strongly supported by industry.



Schematic diagram showing how Sum Frequency (SF) light is generated from the top and bottom interfaces in a Langmuir Blodgett multilayer film. The contributions of the top and bottom layer are combined in the recorded spectrum shown in green on the right hand side of the figure.

### Selected Publications

Diode Laser Spectroscopy of the  $\nu_2$  Fundamental Band of *cis*-HOPO *J. Molecular Spectr.*, 235, 248 (2006)

Optical Sum Frequency Emission from Langmuir-Blodgett Films of Variable Thickness. *Phys. Rev. Lett.*, 96, 077402 (2006)

Adsorption of Sodium Dodecyl Sulfate at the Hydrophobic Solid/Aqueous Solution Interface in the Presence of Poly(ethylene glycol). *Langmuir*, 22, 3105 (2006)