

## **4.2 Linear Optical and Non-Linear Optical Reflection Microscopy on Floating Langmuir Films**

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Linear optical and non-linear optical reflection microscopy was set up in order to perform simultaneous investigations by submarine scanning force microscopy (SAFM) and optical methods. While the SAFM inspects the arrangement of floating non-linear optical Langmuir-Blodgett (LB) molecules from the water side, optical investigations are carried out from the air side. Since the SAFM is mounted within the LB trough both linear optical and non-linear optical microscopy have to be performed in reflection. The major goal with this combined set-up is the possibility for the on-line comparison of both structural and optical properties of linear and non-linear optical LB molecules on the macroscopic and microscopic scale, respectively.

While the polarization microscope has been set up in a former research project we now succeeded in setting up a second harmonic (SH) microscope which allows low incidence angle operation in reflection microscopy. To do so the incoming laser light ( $\lambda = 1064 \text{ nm}$ ) passes a beam splitter to create two laser beams of equal power. The two beams hit the sample surface on the same spot and are phase adjusted. The resulting SH light is sensed perpendicular to the surface and emerges from the same surface area as is scanned by the SAFM especially developed for the inspection of floating Langmuir layers (see chapter 4.1).

The set-up was tested using the non-linear optical molecule 2-docosylamino-5-nitropyridine (DCANP). Although the different surface domains are visible the overall intensity of the reflected SH light is small due to the low incidence angle associated with slightly defocused laser spots of the two incident laser beams. The incidence angle of both entering beams will therefore be altered specifically allowing a perpendicular illumination of the sample surface.