

LABEL-FREE DETECTION OF CHOLESTEROL BY COHERENT ANTI-STOKES RAMAN SCATTERING MICROSPECTROSCOPY

Gregor Hehl, Alexander Kovalev, Nandakumar Patincharath, Andreas Volkmer
3rd Institute of Physics, University of Stuttgart, Pfaffenwaldring 57,
70550 Stuttgart, Germany

E-mail : a.volkmer@physik.uni-stuttgart.de

KEY WORDS: cholesterol, coherent anti-Stokes Raman scattering microspectroscopy, vibrational spectroscopy

We report on the hyperspectral coherent anti-Stokes Raman scattering (CARS) imaging of cholesterol in ternary mixtures of stratum corneum lipids consisting of ceramide, stearic acid and cholesterol, the three main lipid species of stratum corneum. Multiplex CARS microspectroscopy [1] is used for spatially and frequency resolved spectroscopic measurements with sub-micron and 5 cm^{-1} resolution, respectively. The reconstruction of linear Raman spectra from recorded multiplex CARS spectra is achieved by phase retrieval using the Maximum Entropy method [2]. Based on the characteristic Raman bands of cholesterol in both the C=C and C-H stretch Raman shift regions, we demonstrate the quantitative determination of cholesterol concentration, and the formation of cholesterol-rich domain structures in the electroporated stratum corneum model system.

[1] A. Volkmer, "Vibrational imaging and microspectroscopies based on coherent anti-Stokes Raman scattering microscopy," *J. Phys. D: Appl. Phys.*, **38**, R59–R81 (2005).

[2] E. Vartiainen, K.-E. Peiponen, T. Asakura, "Phase Retrieval in Optical Spectroscopy: Resolving Optical Constants from Power Spectra," *Applied Spectroscopy*, **50**, 1283-1289 (1996).