

Chemical mapping of multi-component microemulsions of saturated and unsaturated vegetable oils

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ABSTRACT

We use wide-field CARS microscopy [1, 2] for a spectroscopic analysis of picograms of vegetable oils in multi-component water-oil emulsions containing micron-sized vesicles. Figure 1 shows an olive oil droplet (top) and a linseed oil droplet (bottom) in the emulsion. Both droplets emit a strong CARS signal when the difference of the laser frequencies is tuned to 2850 cm^{-1} belonging to a symmetric C-H₂ stretching vibration. The CARS resonance at 3015 cm^{-1} , however, is highly correlated to the amount of polyunsaturated fatty acid. Therefore, at this frequency only the linseed oil droplet with a high degree of polyunsaturated fatty acids generates an intense CARS signal. We present a chemical analysis of a sequence of different vegetable oils containing different ratios of saturated and unsaturated lipids that illustrate the spectroscopic resolution of CARS.

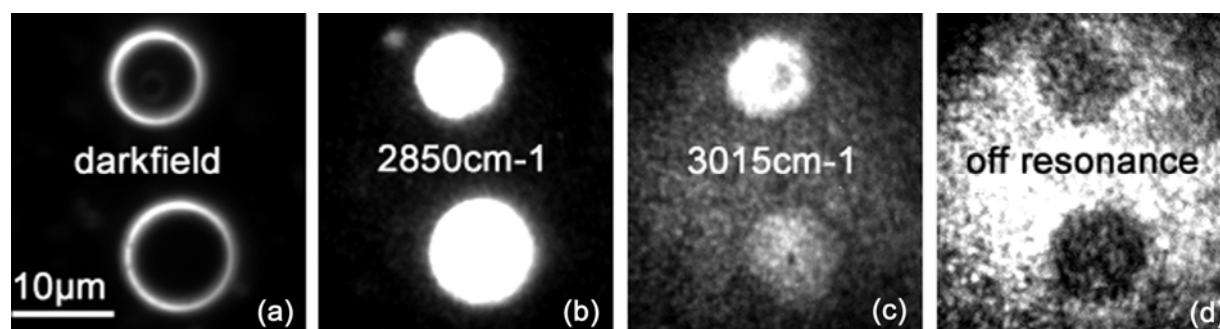


Fig. 1: (a) Dark-field image of an olive oil droplet (top) and a linseed oil droplet (bottom) within a multi-component water oil micro-emulsion. (b) CARS signal at 2850 cm^{-1} corresponding to C-H₂ stretching vibrations. (c) CARS signal at 3015 cm^{-1} addressing C=C stretching vibrations. (d) non resonant background signal from water when detuned by 35 cm^{-1} to 3050 cm^{-1} .

[1] C. Heinrich, S. Bernet, M. Ritsch-Marte, "Wide-field coherent anti-Stokes Raman scattering microscopy." *Applied Physics Letters* **84** (5), 816-818 (2004)

[2] C. Heinrich, S. Bernet, M. Ritsch-Marte, "Nanosecond microscopy with a high spectroscopic resolution." *New Journal of Physics* **8**, 36 (2006)