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

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KEY WORDS: CARS microscopy, vibrational imaging, chemical mapping, saturated and polyunsaturated fatty acids.

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-H\(_2\) 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.

![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-H\(_2\) 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]