



Additional file 3: Curve fitting of Raman spectra recorded for oleic acid (a and b) using 532 nm at 1650 cm^{-1} and 3003 cm^{-1} , respectively. Spectra c to f were recorded for *C. reinhardtii* (CC-503) microalgae using 532 nm (c and d) and 785 nm (e and f) excitations, with curve fitting at 1650 cm^{-1} and 3003 cm^{-1} , respectively. Red curves represent the background corrected Raman spectra whereas blue curves are results of curve-fitting respective band envelopes using combinations of Lorentzian peaks.

Curve fitting information of 1650 cm^{-1} with 3003 cm^{-1} bands:

The intensity ratio values (I_{1650}/I_{1440}) and (I_{2900}/I_{1440}) evaluated using Lorentzian curve fitting 1650 cm^{-1} and the additional olefinic (=C-H stretch) peak located at 3003 cm^{-1} with respect to 1440 peak for a pure fatty acid standard (oleic acid) and microalgae samples. As a proof of validation, we demonstrate the curve fitting and evaluated intensity ratios (shown in the table below) for oleic acid and the control, *C. reinhardtii* (CC-503) microalgae sample, using 532

and 785 nm excitations.

While comparing the intensity ratios 1650/1440, a significant overlap of $-\text{CH}_2$ stretch located $\sim 2900\text{ cm}^{-1}$ can be observed, which in turn results a decrease in carbonyl peak intensity ratio 2900/1440 but found to be satisfactory under these constraints.

Sample details	Excitation source	I_{1650}/I_{1440}	I_{2900}/I_{1440}
Oleic acid (A and B)	532 nm	0.56	0.40
<i>C. reinhardtii</i> (CC-503) (C and D)	532 nm	0.52	0.38
<i>C. reinhardtii</i> (CC-503) (E and F)	785 nm	0.30	0.18