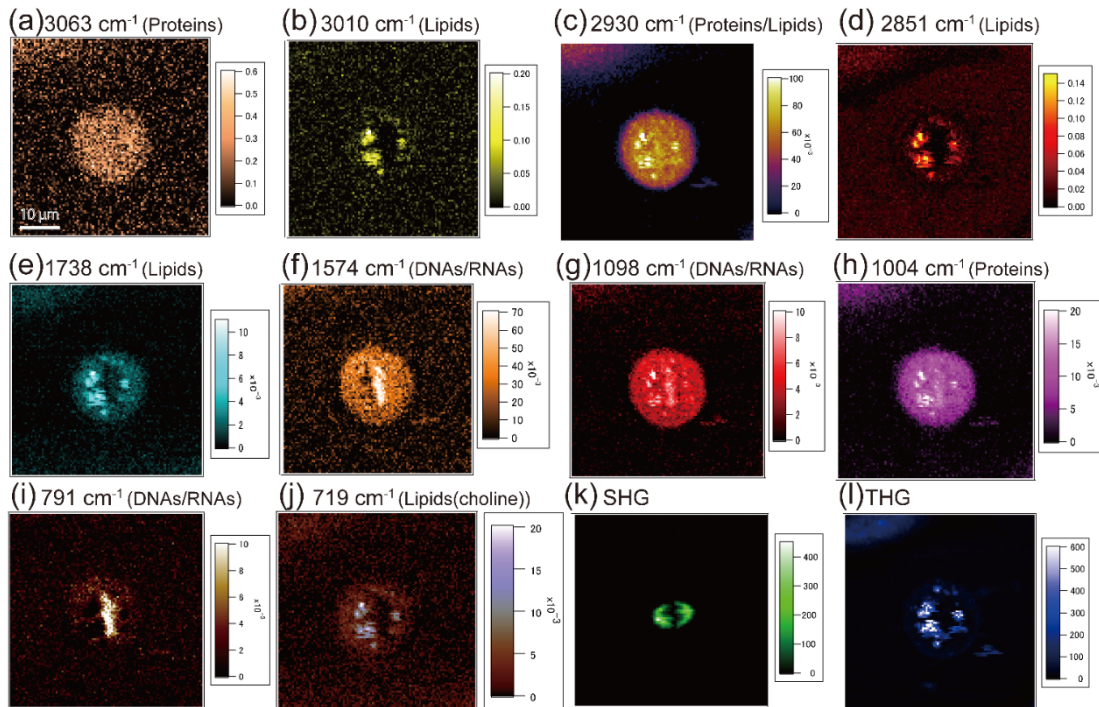
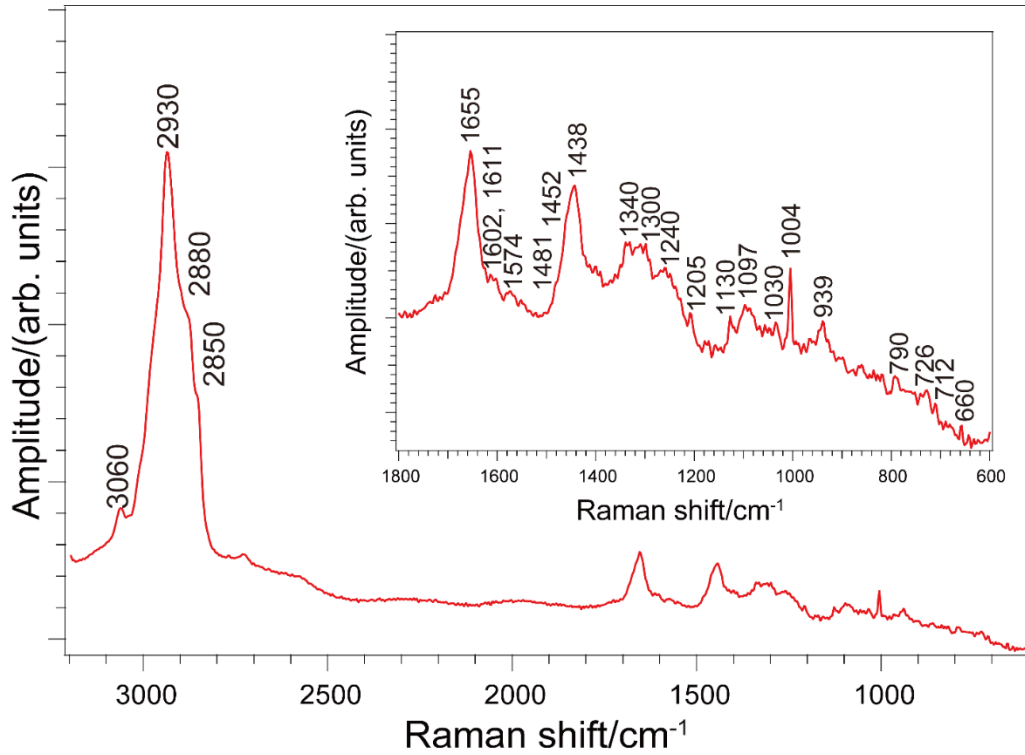




生細胞(HeLa)の細胞内平均 CARS($\text{Im}[\chi^{(3)}]$)スペクトル及びびイメージ





生細胞のラマンスペクトルに現れる典型的なラマンバンドとその帰属¹⁻⁹

Typical Raman shift values(cm ⁻¹)	Assignment	Main molecular components
3060	C-H stretch.(aromatic)	Protein
3010	=C-H stretch.	Lipid
2930	CH ₃ sym. stretch.	Protein/Lipid
2880	Overtone of CH ₃ asym. deform. in Fermi resonance with CH ₃ sym. stretch. / CH ₂ asym. stretch.	Protein/Lipid
2850	CH ₂ sym. stretch.	Lipid
2580	S-H stretch.	Protein
1741	C=O stretch. (ester)	Lipid
1655	cis C=C stretch./Amide I	Lipid/Protein
1611	Tyr, Trp	Protein
1602	Phe	Protein
1574	Purine ring(A and G)	DNA & RNA
1481	Purine ring(A and G)	DNA & RNA
1452	CH ₃ deg. deform.	Protein
1438	CH ₂ scis.	Lipid
1376	T, A, and C	DNA & RNA
1340	CH deform.	Protein
1335	Purine ring(A and G)	DNA & RNA
1300	CH ₂ twist.	Lipid
1260	=C-H bend.	Lipid
1240	Amide III	Protein
1205	C-C ₆ H ₅ (phenyl ring) stretch.	Protein
1130	Skeletal C-C(<i>trans</i>) stretch.	Lipid
1097	PO ₂ ⁻ stretch.	DNA & RNA
1084	Skeletal C-C(<i>gauche</i>) stretch.	Lipid
1063	Skeletal C-C(<i>trans</i>) stretch.	Lipid
1030	In-plane phenyl ring deform.	Protein
1004	Phenyl ring breath.	Protein
939	C-C	Protein
892	C ₂ -C ₁ (<i>trans</i>) stretch./CH ₃ rock.	Lipid
876	C ₂ -C ₁ (<i>gauche</i>) stretch./CH ₃ rock.	Lipid
790	Pyrimidine ring(C, T, and U)/ bk.(O-P-O)	DNA & RNA
726	CH ₂ rock.	Lipid
719	Head group (choline (H ₃ C)N ⁺ sym. stretch.) of phosphatidylcholine	Lipid
709	cholesterol	Lipid
660	C-S stretch.	Protein

Abbreviations: stretch.: stretching; deform.: deformation; rock.: rocking; twist.: twisting; scis.: scissors; bend.: bending; sym.: symmetric; asym.: asymmetric; deg.: degenerate; breath.: breathing; bk.: DNA backbone; A: adenine; C: cytosine; G: guanine; T: thymine; U: uracil; Phe: phenylalanine; Trp: tryptophan; Tyr: tyrosine.

参考文献

1. T. Shimanouchi, *J. Phys. Chem. Ref. Data* **6** (3), 993-1102 (1977).
2. Q. Matthews, A. Brolo, J. Lum, X. Duan and A. Jirasek, *Phys. Med. Biol.* **56** (1), 19-38 (2011).
3. M. T. Cicerone and C. H. Camp, *Analyst* **143** (1), 33-59 (2017).
4. C. Krafft, L. Neudert, T. Simat and R. Salzer, *Spectrochim. Acta, Part A* **61** (7), 1529-1535 (2005).
5. B. W. Barry, H. G. M. Edwards and A. C. Williams, *J. Raman Spectrosc.* **23** (11), 641-645 (1992).
6. H. Deng, V. A. Bloomfield, J. M. Benevides and G. J. Thomas, *Biopolymers* **50** (6), 656-666 (1999).
7. R. G. Snyder, H. L. Strauss and C. A. Elliger, *J. Phys. Chem.* **86** (26), 5145-5150 (1982).
8. R. G. Snyder and J. R. Scherer, *J. Chem. Phys.* **71** (8), 3221-3228 (1979).
9. K. G. Brown, E. Bicknell-Brown and M. Ladjadj, *J. Phys. Chem.* **91** (12), 3436-3442 (1987).