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CARS molecular fingerprinting using a supercontinuum light source !

Spectroscopic imaging, leveraging advanced nonlinear Raman scattering techniques such as coherent anti-Stokes Raman scattering (CARS) and stimulated Raman scattering (SRS), offers a robust approach for label-free microscopic molecular visualization. Notably, multiplex CARS delivers an extensive spectral coverage of around 3000 cm^{-1} , encompassing the entirety of fundamental vibrational modes [1,2]. This methodology typically utilizes a solitary master laser source paired with supercontinuum (SC) radiation. Within our research, we harnessed a multimodal nonlinear optical microscope to visualize mouse brain tissue, integrating both multiplex CARS and second harmonic generation (SHG) channels. Our imagery provides compelling insight into the hippocampus. Beyond visualizing signals associated with the myelin sheath at 2850 cm^{-1} , the ratio image of OH stretching (3400 cm^{-1}) to CH_3 stretching mode (2930 cm^{-1}) distinctly delineates cell nuclei. Moreover, we pinpointed pronounced SHG spots in the dentate gyrus. These SHG spots were identified not only in the dentate gyrus but also in CA1, regions dense with mature neurons. Consequently, we have ascertained them to be Rootletin, an integral molecule of the primary cilium's rootlet.

References

- [1] T. W. Kee, and M. T. Cicerone, *Opt. Lett.*, 29 (2004) 2701.
- [2] H. Kano, and H. Hamaguchi, *Appl. Phys. Lett.*, 86 (2005) 121113.
- [3] T. Akiyama, A. Inoko, Y. Kaji, S. Yonemura, K. Kakiguchi, H. Segawa, K. Ishitsuka, M. Yoshida, O. Numata, P. Leproux, V. Couderc, T. Oshika and H. Kano, *Sci. Rep.*, 7 (2017) 39967.

Figure

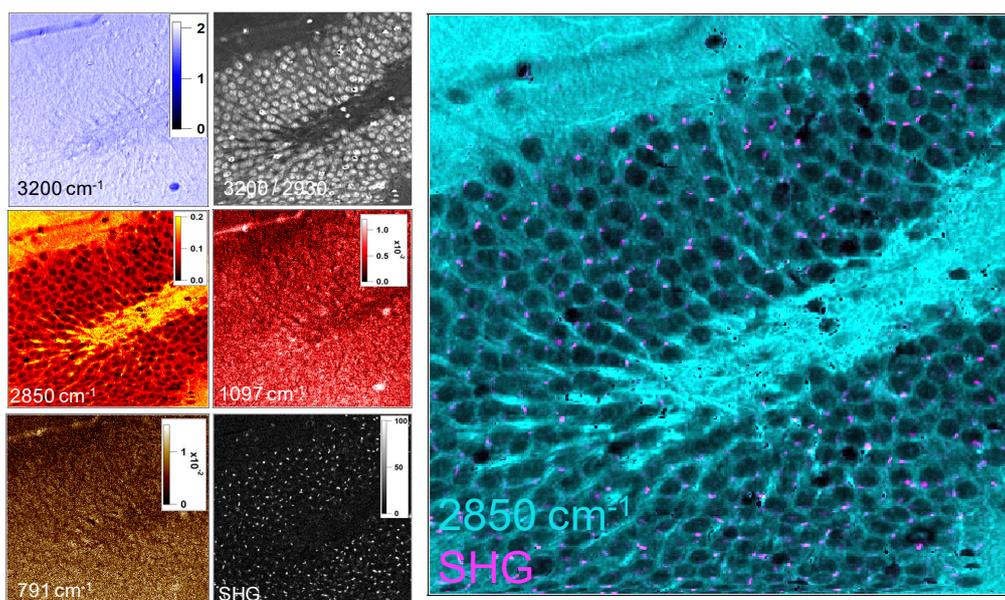


Figure 1: On the left, we have the Multiplex CARS images captured at 3200 , 2850 , 1097 , and 791 cm^{-1} , as well as the ratio image contrasting 3200 cm^{-1} to 2930 cm^{-1} . On the right, there's a composite image blending the CARS visualization at 2850 cm^{-1} (depicted in cyan) with the SHG image (presented in magenta).