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## “Coherent Raman microscopy with electronic enhancement”

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場 所: 理学部1号館3階337A号室+ZOOMでの開催(事前登録制)

### 【Abstract】

Label-free imaging techniques have recently met a lot of interest as a complement to fluorescence based imaging approaches. Among these are imaging modalities such as second harmonic generation (SHG) and third harmonic generation (THG) microscopy that allow contrast generation based on symmetry breaks in the samples. Contrast with molecular selectivity can be achieved with non-linear Raman microscopy that is now employed by many groups worldwide. The special advantage of these techniques that no sample labelling is necessary. Instead, molecule specific contrast is generated based on the vibrational spectra of sample molecules. The two main approaches of this type are coherent anti-Stokes Raman scattering (CARS) microscopy and stimulated Raman scattering (SRS) microscopy. While the basic mechanism behind the two techniques is the same, the required experimental setups differ significantly, mainly with respect to the detection scheme. In this contribution, I will give an overview of the state of the art for the different nonlinear Raman microscopy techniques. Different experimental approaches will be shown and their virtues will be demonstrated with examples from cell biology, material science, and biomedicine. Special emphasis will be put on the discussion of recent efforts to increase the sensitivity of SRS[1-4] and CARS[5] microscopy by exploiting electronic resonances. I will demonstrate that using this approach, the detection of vibrational spectra of single molecules is within reach.

[1] P. Fimpel, A.J.X. Choorakuttil, A. Pruccoli, L. Ebner, S. Tanaka, Y. Ozeki, M.J. Winterhalder, A. Zumbusch, Double modulation SRS and SREF microscopy: signal contributions under pre-resonance conditions, *PhysChemChemPhys*, 22 21421 (2020).

[2] A. Pruccoli, M. Kocademir, M. Winterhalder, A. Zumbusch, Electronically pre-resonant stimulated Raman scattering microscopy of weakly fluorescent chromophores, *J. Phys. Chem. B*, 127 6029 (2023).

[3] A. Choorakuttil, A. Pruccoli, M.J. Winterhalder, P. Zirak, D. Gudavicius, G. Martynaitis, D. Petrulionis, D. Samsonas, L. Kontenis, A. Zumbusch, Electronically preresonant stimulated Raman scattering microscopy in the visible, *Appl. Phys. Lett.*, 123 164701 (2023).

[4] A. Pruccoli, A. Zumbusch, High sensitivity stimulated Raman scattering microscopy with electronic resonance enhancement, *ChemPhysChem*, 25 e202400309 (2024).

[5] R. Burde, N. Reuter, A. Pruccoli, Z. Birech, M. Winterhalder, A. Zumbusch, Electronically Preresonant Coherent Anti-Stokes Raman Scattering Microscopy, *J Raman Spec*, in press

使用言語 : 英語 (English)

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