

Feasibility Study on Ultra-high spatial-resolution X-ray Imaging using STED Technique

Observation of the dynamics for cell and its inside is required to reveal the mechanism of life activities; For example, how virus invade host cell, how liquid-liquid phase separation in the cell became to disorder. To observe such dynamics, high spatial-resolution of less than 50 nm is required, and X-ray is available for the in vivo imaging or Non-destructive Testing. To realize such high resolution against diffraction limit, we have focused on the Stimulated Emission Depletion Microscopy (STED) technique. In the visible region, STED camera have already developed, while not yet in the X-ray region. Thus, we have developed soft-X-rays STED devices consisting of a scintillation material using soft X-rays.

The soft X-rays imaging with STED technique was demonstrated as the first feasibility study in this time. We used the synchrotron radiation light (beamline BL11D, Photon Factory, KEK) with an energy of 800 eV as the soft X-ray source, and also laser photons with energies of 1.97 eV (630 nm) to 2.58 eV (480 nm) as the STED light. Ce-doped Lu_2SiO_5 (Ce:LSO) scintillator was irradiated with such photons (X-ray and STED light), and we succeeded in observation of the STED phenomenon and its imaging. Moreover, we have developed suitable scintillation material for this STED applications.

In this presentation, we show the mechanism the STED technique with soft X-ray, the above results and the future plan.

Workshop topics

Sensor materials, device processing & technologies

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