REALTIME IMAGING OF LIPID BILAYER VESICLE WITH MULTI-FOCUS CARS MICROSCOPE

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CARS (coherent anti-Stokes Raman scattering) microscopy is a powerful tool for three-dimensional imaging of biological specimen without staining[1, 2]. For high-speed imaging, we have developed a multi-focus CARS microscope using a microlens array disk[3]. Figure 1 shows the developed CARS microscopy system. As light source, highly synchronized two ps Ti:sapphire lasers were used, and the beams were split into multiple beamlets by a rotating microlens array disk to excite multiple points of a specimen simultaneously. The jitter between the two lasers was reduced to 211 fs with 5 kHz bandwidth and the pulse duration was optimized within 0.3 s at the point by point wavelength scanning.

We demonstrated realtime CARS images of polystyrene beads (Fig. 2) and DPPC (dipalmitoylphosphatidylcholine) vesicle (Fig. 3). The Brownian motion of polystyrene beads was clearly observed at 1000 cm⁻¹ with the frame rate of 33 ms. The three dimensional DPPC vesicle was observed at 1442 cm⁻¹ within 7 s (100 ms/image).