Visualization of Acoustic Vibration of Plasmonic Single Nanorods in Real Space and Time

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With advances in spatial resolution reaching the atomic scale, 2 and 3 dimensional (D) imaging in transmission electron microscopy (TEM) has become an essential methodology in various fields of research providing *static* structural information. Now it has become possible to integrate the ultrahigh temporal resolution (fourth dimension) to the 3D spatial resolution of TEM.[1-5] Here, presented is the concept and recent application of time-resolved imaging in ultrafast electron microscopy (UEM), which made it possible to directly visualize a single gold nanorod (Au NR) undergoing plasmonic-acoustic vibration of sub-nanometer amplitude and picosecond period, upon femtosecond-pulsed light excitation for the first time. The unique integration of a direct electron detection camera[6] to ultrafast electron microscopy in combination of achieving control over the quality of pulsed electron beam enabled the unprecedented spatiotemporal resolutions with selective and characteristic vibrations of a single Au NR being unveiled in contrast to conventional optical spectroscopic measurements on ensembles.

References

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