

Time-resolved transmission electron microscopy in material science

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Time-resolved measurement in a transmission electron microscopy (TEM) holds promises of revealing intrinsic feature in nano-materials. Our group had developed time-resolved TEM (TR-TEM) using photocathode-type electron gun which could synchronize with time-structure of pulsed laser. The TR-TEM can provide a narrow energy width of below 0.3 eV and 1-ps pulse duration of electron beam. Furthermore, it has been clarified that the pulsed electron could contribute to observe time evolutions of electromagnetic field. High charge electron pulse in TRTEM also has possibility to realize operando-measurement of rock friction via nanosecond single-shot imaging, which can investigate rock friction at high sliding velocity and effect of ambient temperature, pressure, and pore pressure on friction. The technique will open to access nanometer-scale mechanics of faulting origin in geoscience. We would like to introduce overview of our apparatus and recent status of ultrafast measurement in electron microscopy.

Keywords: transmission electron microscopy, time resolved