

Ultrafast laser-induced electron emission from nanostructures is fundamentally important to the development of coherent electron sources, compact radiation sources and accelerators, ultrafast electron microscopy, and novel nano-vacuum devices. This talk summarizes recent development on the modeling of electron emission physics at ultrafast and ultra-small scale. Our short-pulse emission model is valid for arbitrary pulse length from sub-cycle to CW excitation, and for arbitrary pulse repetition rate. The single formulation is valid from photon-driven electron emission to field-driven emission as optical intensity increases. Also presented are electron emission enhancement from coated surfaces and strong current rectification in an optical field-driven nanogap.

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