

Abstract

Theory and Modeling of Ultrafast and Nanoscale Interfacial Electron Transport

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Electron transport across interfaces of dissimilar materials (including vacuum) is of fundamental importance to current-carrying components and devices, including pulsed power systems, ultrafast electron sources, compact accelerators, and miniaturized electromagnetic radiation sources (microwave to millimeter wave to THz to x-ray). The rapid development in nanotechnology and ultrafast lasers has opened up great opportunities to control electron beam dynamics at ultrashort spatial-temporal scales, which offers unprecedented scientific advances. This talk will review recent modelling efforts on ultrafast and nanoscale diodes. The physics of quantum tunneling, ultrafast electron emission and transport, and electrical contact resistance will be highlighted. Future research prospects will be discussed.