**Significance of back-flow of thermal energy in multilayer thin films under femtosecond laser pulses**

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Thermal transport in nano-electronic devices, thin films and nanosized multilayer structures has been considered as an important topic in the field of nanoscale heat transfer, because in nanoscale viewpoint the thermal behaviors of heat carriers i.e., electrons and phonons play a vital role in heat transfer physics. When a multilayer thin film is subjected to short heating pulses, the interfacial thermal transport through various heat dissipation channels between electrons and phonons can be observed, which leads to faster electron cooling and in particular back-flow of thermal energy from interlayer to the top layer lattice. The back-flow of thermal energy can increase the phonon temperature of top layer which must be studied in detail in order to better understand the thermal behavior of phonons and thermal transport at the interface of different layers. The Boltzmann transport equation is coupled with diffusive two-temperature model, and numerically solved, and it has been shown that inserting a metallic interlayer with high electron-phonon coupling constant can create different interfacial heat dissipation channels, and more interestingly the back-flow of heat from interlayer lattice to the top layer.