Influence of the spatial and temporal structure of the deposited-energy distribution in swift-ion-induced sputtering

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The sputter processes occurring under swift-ion bombardment in the electronic-stopping regime are investigated by molecular-dynamics simulations performed for a Lennard-Jones solid (Ar). Two aspects of the dynamics of the excited electronic subsystem are included in the simulation and their influence on the sputter yield is studied. First, we assume the energy transfer from the electronic to the atomic system not to be instantaneous, but to last for a period of time τ. For $\tau \gtrsim 1$ ps, we find the sputter yield Y to become strongly nonlinear as a function of the stopping power dE/dx. Second, we test the influence of a nonhomogeneous spatial distribution of the electronic excitations. It is shown that such a spatial distribution also leads to a strongly nonlinear dependence of Y on dE/dx.