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Single ion impact effects on semiconductor and insulator surfaces induced by slow, very highly charged ions

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The interaction of slow (<5 keV/u), very highly charged ions, such as Xe^{44+} and Au^{69+}, with solid surfaces is dominated by the deposition of potential energy, rather then the kinetic energy of the ions [1, 2]. For Au^{69+}, the sum of the binding energies of the electrons that were removed when forming the ion is 170 keV. This energy is deposited into a nanometer scale area within about 10 fs when an Au^{69+} ion impinges on a surface [3]. In our presentation we will report on the characterization of undoped silicon after exposure to low doses (~10^{11} cm^{-2}) slow, highly charged ions. We recently observed strong photoluminescence at ~565 nm from irradiated silicon surfaces [4]. Possible microscopic mechanisms for this effect will be discussed. We will compare atomic force microscopy data from surface defects induced by single ion impacts on mica, self-assembled monolayers and silicon in light of model descriptions of the materials response to the impact of slow, highly charged ions.

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