“Knocking on Surfaces”
Interactions of hyperthermal particles with metal surfaces

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The study of gas-surface interaction dynamics is important both for the fundamental knowledge it provides and also to aid the development of applications involving processes such as sputtering, plasma etching and heterogeneous catalysis. Elementary steps in the interactions, such as chemical reactions, adsorption and scattering are prototypical of more complex processes and better understanding of them deepens our knowledge of such processes. In addition, experimental measurements of specific interactions can be used to validate advanced computer models. Hence the experiments in this thesis have been carried out under well-defined condition, namely in ultrahigh vacuum (UHV) and using high-purity single-crystal samples. The thesis is primarily focussed on understanding the interaction of hyperthermal Ar and N (~4-6 eV) with Ru(0001) and Ag(111) via scattering studies. Ar is very inert and its interaction with surfaces is primarily repulsive in nature, while N atoms probe the surface chemisorption well. From the study of Ar scattering dynamics, surface properties have been probed. From N scattering studies, chemisorption dynamics have been investigated. It is found that the electronic state of the incident particle may play an important role in the gas-surface interaction. Separately, the influence of pre-adsorbed CO on Ru(0001) on D_2 dissociation have been unravelled.