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Heterogeneous Reaction Dynamics

Description: Heterogeneous Reaction Dynamics Steven L. Bernasek In their classic book published in 1974, R.D. Levine and R.B. Bernstein defined molecular reaction dynamics as being "concerned with the molecular level mechanism of elementary chemical reactions." Recent experimental and conceptual advances have moved this field beyond the study of the detailed dynamics of gas phase chemical reactions, to the dynamics of reactions occurring at the gas-solid interface. Heterogeneous reaction dynamics thus is defined as the study of the molecular level mechanism of elementary chemical reactions occurring at interfaces between two phases. This area of research has important implications for catalysis and solid-state electronics, including the manufacture of semiconductors, integrated circuits, and other solid-state devices. Heterogeneous Reaction Dynamics is organized around case studies from the literature. The case studies included all involve surfaces that are well characterized as to structure and composition, and gas phase participants in the heterogeneous reaction that are well characterized at the molecular level. Introductory chapters describe the surface characterization methods and reaction dynamics approaches shared by all the case studies presented. Subsequent chapters cover inelastic scattering of molecules from surfaces and the problem of energy transfer on collision; the processes of adsorption, film growth, and adsorbate interactions; surface diffusion; the dynamics of dissociative adsorption of small molecules on initial collision with the surface; atom recombination on surfaces; catalytic oxidation; and small molecule decomposition processes. Each chapter begins with a discussion of the experimental methods particular to the case studies described. Heterogeneous Reaction Dynamics is directed to advanced undergraduates and beginning graduate students in chemistry and molecular physics who would like an introduction to the detailed dynamics of chemical reactions occurring on well characterized solid surfaces. Electronics engineers and condensed-matter physicists also will find this book to be a valuable resource.

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