1. INTRODUCTION

An understanding of the elementary processes whereby gases interact with a solid, that is of 'adsorption', is intimately related to investigations of heterogeneous catalysis (1-9). Adsorption, however, encompasses almost as broad a range of phenomena as encountered in the traditional disciplines of chemistry and physics. To compensate for this complexity, powerful experimental techniques have been developed for use in adsorptive and catalytic studies. Investigators are primarily concerned with the elucidation of the role of adsorbed species in catalysis, which is still incompletely understood and widely debated.

The term 'catalysis', coined by Berzelius, is used to describe the action of a 'catalyst', a substance that increases the rate at which a chemical reaction reaches equilibrium. This phenomenon has been extensively studied for nearly a century and a half, and used unconsciously for a much longer period. Heterogeneous catalysis describes the enhancement in the rate of a chemical reaction brought about by the presence of an interface between two phases. Research into the mechanisms of reactions occurring at interfaces between solids and gases is of particular interest because of their wide applicability in chemical industries.

The work reported in this thesis relates to the study of adsorption of gases on metal-oxide systems vis-a-vis their catalytic activity. In the introduction, progress in the understanding of adsorption phenomena involving gases on solids is briefly reviewed, with particular emphasis on developments in the knowledge of the structure and properties of the solid state.