PREFACE

Catalytic oxidation processes are a Utopian achievement of the chemical industry. These form a very valuable and useful tool in the hands of the chemist and have been largely responsible in bringing the chemical industry to its present state of development.

Of the oxidation processes, the controlled oxidation of hydrocarbons or other organic compounds to get commercially important intermediate oxidation products, is the most promising for the entire organic technology and has great utility in the petrochemical industry. Air is the cheapest reagent for oxidation and the one which is always employed in the catalytic oxidation when possible. It involves no other cost except the power to blow it into reactor. The catalytic oxidation with air has another distinct advantage that there are no burdensome by-products the removal or the disposal of which may become a problem.

The catalytic vapour phase oxidation of organic compounds is quite attractive, but the success of such a process depends on the development of a suitable catalyst which has a specific activity to give high yields of the particular desired product with minimum of by-products and has a constant activity over a fairly long period of use.

The development of such a catalyst for any particular reaction involves, as a first step, an investigation of the activity of
a number of basic oxidation catalysts under different reaction conditions, followed by a detailed and systematic study of the effect of various promoters, inhibitors, catalyst supports and other process variable on the catalytic activity of the specific catalyst.

The various physical methods of examining a catalyst help a great deal in understanding their role and mechanism of the catalyzed reaction. A direct approach to this is the study of the catalyst surface which is responsible for the catalytic activity.

The investigations embodied in this thesis relate to the catalytic vapour phase oxidation of some organic compounds and the role of vanadium oxide catalysts in these oxidations. The reactions studied have all got great industrial importance.

Part I of this thesis deals with the catalytic oxidation of ortho, meta and para xylenes individually. In Part II, the investigations on the adsorption of oxygen over vanadium oxide catalysts, used for the oxidation of xylenes are reported.

Part III contains the investigation on the oxidation of ethylene to ethylene oxide.