

**SURFACE AND CATALYTIC PROPERTIES OF BISMUTH  
OXIDE—MOLYBDENUM OXIDE CATALYSTS**

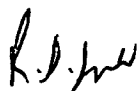
A THESIS SUBMITTED TO THE  
INDIAN INSTITUTE OF TECHNOLOGY, NEW DELHI  
FOR THE DEGREE OF  
DOCTOR OF PHILOSOPHY  
IN CHEMISTRY

BHUMITRA CHOPRA  
CHEMISTRY DEPARTMENT  
OCTOBER, 1970

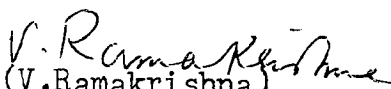
C E R T I F I C A T E

This is to certify that the thesis entitled "Surface and Catalytic Properties of Bi-oxide - Mo-oxide Catalysts", being submitted by Miss Bhumitra Chopra to the Indian Institute of Technology, Delhi, for the award of the Degree of Doctor of Philosophy in Chemistry, is a record of bonafide research work carried out by her. Miss Bhumitra Chopra has worked under my guidance and supervision and has fulfilled the requirements for the submission of this thesis.

The results contained in this thesis have not been submitted, in part or in full, to any other University or Institute for the award of any degree or diploma.



Head of Chemistry Department,  
Indian Institute of Technology,  
Hauz Khas, New Delhi-29.

  
(V. Ramakrishna)  
Thesis Supervisor.

## A C K N O W L E D G E M E N T S

I am extremely grateful to Prof. V.Ramakrishna, presently Visiting Research Professor, Department of Chemistry, Brunel University, London, U.K., for his constant encouragement and inspiration throughout my research work. But for his kind help which he rendered me any time, this work would not have been possible.

My grateful thanks are due to Prof. R.D.Dua, Head of the Department of Chemistry, Indian Institute of Technology, Delhi, for his interest in my work.

I take this opportunity to thank Dr. N.K.Sandle, Chemistry Department, Indian Institute of Technology, Delhi, for his valuable suggestions.

It is a pleasure to acknowledge the co-operation received from all the members of faculty and graduate students, especially from Dr. K.C.Narang of the Chemistry Department, Indian Institute of Technology, Delhi.

I also wish to thank the Director, Prof. R.N.Dogra, for providing necessary facilities for carrying out this research work.

Thanks are due to Mr. R.N.Shukla for expert typing of the thesis.

*Bhumitra Chopra*  
(Bhumitra Chopra)  
Department of Chemistry  
Indian Institute of Technology  
Hauz Khas, New Delhi-29.

## C O N T E N T S

	Page
Chapter I.      Introduction	1
Scope of the present investigations	
Chapter II.     Experimental methods	19
Chapter III.    Preliminary surface studies with Bi-oxide - Mo-oxide samples,	37
Surface area measurement, Adsorption of para-nitrophenol from solution, Surface acidity, Differential thermal analysis and Oxygen chemisorption	
Chapter IV.     Adsorption from binary liquid mixtures on Bi-oxide - Mo-oxide catalysts	56
Chapter V.      The decomposition of $H_2O_2$ in the presence of Bi-oxide - Mo-oxide catalysts	98
Chapter VI.     Oxidation of chlorotoluenes on Bi-oxide - Mo-oxide catalysts	123
Chapter VII.    Summary of conclusions and suggestions for further work	159