

CONTENTS

1. Introduction	1
2. Aluminum Oxide and Hydroxides	7
Historical	7
Aluminum Hydroxides	8
Aluminum Oxide-Hydroxide (AlOOH)	17
Gelatinous Aluminum Hydroxides	19
Aluminum Oxide (corundum)	22
β -Alumina and Related Compounds	23
Phase Relationships in the $\text{Al}_2\text{O}_3\text{-H}_2\text{O}$ System	25
Nomenclature	27
3. Industrial Production of Aluminum Hydroxides	31
Industrial Production	31
Bauxite: The Principal Raw Material	32
Bayer Process	33
Sinter Process	38
Combination Process	40
Bayer Hydroxide Product Variants	41
Production of Other Aluminum Hydroxides	46
4. Aluminum Hydroxides: Industrial Applications	55
Filler in Plastics and Polymer Systems	55
Paper Applications	63
Raw Material for Production of Other Aluminum Compounds	65
Cosmetics and Pharmaceuticals	67
Glass Industry	67
Other Applications	67
Analytical Procedures for Aluminum Hydroxides	68
5. Activated Aluminas	73
Thermal Dehydration of Aluminum Hydroxides and Formation of Transition Aluminas	73
Thermal Effects	83
Textural Changes: Development of Pore Structure and Surface Area	86
Other Sources of Transition Aluminas	93
Concluding Remarks	93

6. Industrial Production of Activated Aluminas	97
Activated Bauxites	97
Activated Aluminas from Bayer Hydroxide	97
Activated Alumina from Boehmite and Gelatinous Aluminum Hydroxide	102
Activated Alumina from Bayerite	105
7. Activated Alumina: Adsorbent Applications	107
Gas Drying	108
Liquid Drying	119
Water Purification	120
Hydrocarbon Recovery and Selective Adsorption Applications	121
Maintenance of Power System Oils	122
Chromatography	123
Recent Developments in Adsorbent Aluminas	126
Analytical Methods for Activated Aluminas	128
8. Catalytic Aluminas	133
Surface Structure and Catalytic Activity	134
Examples of Commercial Catalytic Processes Using Alumina Catalysts	138
Alumina as Catalyst Support	143
Examples of Catalytic Processes Using Alumina-Supported Catalysts	144
9. Sodium Aluminate	151
Physical and Chemical Properties	151
Commercial Production	153
Analysis	154
Uses	154
10. Economic Data for Alumina Chemicals	157
Overview	157
Producers	157
Aluminum Hydroxides	158
Adsorbent Activated Aluminas	159
Alumina Catalysts and Catalyst Supports	159
Sodium Aluminate	160
Index	161