

CONTENTS

1	Introduction	
1.1	General introduction	1
1.2	Classification of catalyst deactivation processes	3
	References	6
2	General Aspects of Catalyst Deactivation	
2.1	Poisoning of catalysts	7
2.2	Coke formation on catalyst	13
2.3	Metal deposition on catalysts	19
2.4	Sintering of catalysts	22
	References	27
3	Diffusion and Deactivation of Catalysts	
3.1	Introduction	29
3.2	Mass and heat transport in catalyst pellets	31
3.3	Diffusion and reaction transport	38
3.4	Deactivation and diffusion	43
3.5	Correlations for activity decay	49
3.6	Separable and non-separable kinetics	52
	References	53
4	Catalyst Deactivation by Sintering	
4.1	Introduction	55
4.2	Structural features of catalysts relevant to sintering	56
4.3	Experimental data	57
4.4	Mechanisms of sintering for supported metal catalysts	63
4.5	General summary of current sintering knowledge	79
5	Catalyst Deactivation by Poisoning	
5.1	Some common poisoning processes	81
5.2	Minimization of poisoning	85
5.3	Poisoning of automobile catalysts	87
5.4	Analysis of poisoning processes	88
5.5	Effect of poisoning on catalyst selectivity	107
	References	108

6	Catalyst Deactivation by Fouling	
6.1	Fouling by coke deposition	110
6.2	Catalyst deactivation due to deposition of impurities in the onto the catalyst	140
	References	143
7	Deactivation in Catalytic Reactors	
7.1	Introduction	145
7.2	Poisoning in fixed bed reactors	147
7.3	Coking of catalytic reactors	157
7.4	Thermal sintering of reactors	183
7.5	Reactor dynamics and catalyst deactivation	184
	References	189
8	Optimization of Deactivating Reactor Systems	
8.1	Comparison of various reactor types under deactivating conditions	190
8.2	Optimization of deactivating reactors	199
	References	210
9	Regeneration of Deactivated Catalysts	
9.1	Feasibility of regeneration	212
9.2	Description of coke deposit and kinetics of regeneration	214
9.3	Regeneration of fluidized bed catalysts	218
9.4	Regeneration of coked catalyst pellets	219
9.5	Regeneration of fixed beds containing coked catalysts	242
	References	260
	Subject Index	261