

CONTENTS

CONTRIBUTORS	v
PREFACE	vii

1

THERMODYNAMIC ANALYSIS OF NUCLEAR POWER STATIONS

Seymour Baron

I. Introduction	1
II. Steam Cycle Efficiency	17
III. Auxiliary Power	21
IV. Over-All Heat Cycle Efficiency	23
V. Turbine Design for Low-Temperature Reactors	24
VI. Power Conversion Cycles for Low-Temperature Reactors	26
VII. Economics	31
References	35

2

THE GBSR: A GRAPHITE MODERATED BOILING WATER STEAM SUPERHEAT REACTOR

L. S. Mims and D. J. Stoker

I. Introduction	38
II. Summary Description of a 300-Mwe Plant	47
III. Discussion of the Concept	52
IV. Conclusions	59
V. Description of a 300-Mwe Plant	60
VI. Pertinent Economics	77
Acknowledgments	82
References	83

3

RADIATION-INDUCED GRAFT POLYMERIZATION

George Odian and Horace W. Chandler

I. Introduction	86
II. Techniques of Grafting	87

X CONTENTS

III. Mechanism of Graft Polymerization	88
IV. Effects of Polymer Structure	97
V. Effect of Additives	103
VI. Properties of Graft Copolymers	106
References	108

4

DIFFUSION IN URANIUM, ITS ALLOYS, AND COMPOUNDS

Steven J. Rothman

I. Introduction	111
II. Diffusion in Single-Phase Uranium Alloys	113
III. Diffusion in Multiphase Uranium Alloys	131
IV. Diffusion of Gases in Uranium	153
V. Diffusion in UO_2	160
VI. Conclusions	167
Acknowledgments	171
References	171

5

PERFORMANCE CHARACTERISTICS OF
LARGE BOILING WATER REACTORS

G. M. Roy and E. S. Beckjord

I. Introduction	179
II. Plant Description	180
III. Physics Tests	185
IV. Stability	193
V. Power Distribution and Measurement	217
VI. Load Following and General Characteristics of Operation	219
References	223

6

ECONOMICS OF NUCLEAR POWER

John E. Ullmann

I. Introduction	225
II. The Problem of Technological Substitution	227
III. The Effects of Equipment Production Techniques	230
IV. Political Factors	230
V. Prospective Costs of Conventional Power Plants	231
VI. Conventional Fuel Costs	235
VII. Nuclear Fuels	237
VIII. Reactor Types	238
IX. The Effect of Fixed Costs	239
X. New Methods of Power Generation	240

XI. Future Demands for Electric Power	241
XII. Conclusions	244
References	245

7

CHEMONUCLEAR REACTORS AND CHEMICAL PROCESSING

Meyer Steinberg

I. Introduction	248
II. Radiation and Fission Fragment Chemistry	252
III. Fission Fragment Chemonuclear Reactors	268
IV. Neutron-Gamma Chemonuclear Reactors	304
V. Proposed Chemonuclear Processes	307
VI. Economics of Chemonuclear Processes and Comparison with Conventional Processes	316
VII. Thermonuclear and Electrochemonuclear Reactors for Chemical Production and Power Production Purposes	327
References	330
AUTHOR INDEX	335
SUBJECT INDEX	345