

Contents

1	History Creation of a Nuclear Rocket Engine Reactor.	1
	References	7
2	Design of a NRER	9
	References	20
3	Methods of Modeling Tests.	21
3.1	Equipment for Measurement of Materials’ Strength at High Temperature	22
3.2	Thermal Test Methods	23
3.3	Methods of Structural Researches	27
	References	27
4	Materials of the Reactor Core	29
4.1	Thermodynamic and Structural Characteristics of Materials	30
4.1.1	Melting Temperature and Evaporation	30
4.1.2	Diffusion Characteristics	33
4.2	Processing Technology of the Structural Ceramic Materials	34
4.3	Mechanical Properties of Fuel and Structural Materials	42
4.3.1	Strength of Materials at Different Loading Mode	42
4.3.2	Influence of Structural Parameters on Strength and Fracture	46
4.3.3	Temperature Dependences of the Strength and Creep . . .	50
4.3.4	The Thermal Stress Resistance	54
4.4	Materials of the Heat Insulating Package	58
4.5	Hydride Compositions for a Neutron Moderator	63
4.6	Possible Methods for Increasing the Strength Parameters of Ceramics	65
	References	69

5	Radiation Resistance of the HRA Elements	71
5.1	Radiation Durability of Graphitic Materials	77
5.2	Radiation Durability of Moderator Material	77
	References	78
6	Corrosion of Materials in the Working Medium	81
	References	87
7	Bearing Capacity of Elements' HGA	89
7.1	Fracture Criteria of Thermally Loaded Bodies	89
7.2	Operating Conditions of NRE Fuel Elements	92
7.3	Trial Tests of NRE Fuel Elements	94
7.4	Bearing Capacity of the HIP	99
7.5	Bearing Capacity of a Bearing Grid of the HRE	100
7.6	Possible Methods for Increasing Bearing Capacity of Ceramics	101
	References	102
8	Outlook for Nuclear Rocket Engine Reactors	103
	References	104
	Index	107