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COOLANT, NEUTRON MODERATOR AND REFLECTOR FOR INNOVATIVE NUCLEAR FACILITIES -- ABSTRACT -- INTRODUCTION -- I. NEUTRON-PHYSICAL PROPERTIES AND ADVANTAGES OF RADIOGENIC LEAD -- II. ADVANTAGES FROM APPLICATIONS OF IN FAST REACTORS 208 PB -- II. A. Improvement of the Reactor Safety. Coolant Temperature Reactivity Coefficient -- II.B. Prompt Neutron Lifetime 20 -- II.B.1. One-Dimensional Axial Model of Reactor -- II.B.2. Reactor Kinetics -- II.B.3. One-Dimensional Axial Model of the Fast Reactor Brest* with Thick Reflector -- II.B.4. Spherical Model of the Fast Reactor Brest* with Thick Reflector. II.B.5. Impact of Reflector Parameters on Fission Distribution and Neutron Spectrum -- II.C. Models of Neutron Kinetics in the Fast Reactor Brest* with Thick Reflector -- II.C.1. One-Point Model -- II.C.2. Multi-Point Model -- II.C.3. Neutron Kinetics of the Fast Reactor Brest* with Thick Pb Reflector 208 -- III. ENHANCED PROLIFERATION RESISTANCE OF PU-CONTAINING FUEL -- IV. THERMAL-HYDRAULIC ADVANTAGES OF THE REACTOR CORE COOLED BY 208Pb as a coolPB -- V. REPLACEMENT OF NITRIDE BY OXIDE URANIUM-PLUTONIUM FUEL -- VI. POTENTIAL FOR FUEL BREEDING IN AXIAL URANIUM BLANKETS -- VII. ADVANTAGES FROM APPLICATION OF 208PB IN ADS-SYSTEMS -- VII.A. High Neutron Flux in an ADS Blanken -- VII.B. Transmutation in Resonance Range of Neutron Energy -- VII.C. High-Flux ADS with Cooled Transmutation Zone -- VIII. NATURAL RESOURCES OF RADIOGENIC LEAD -- CONCLUSION -- REFERENCES -- PHOTOCHEMICAL LASER SEPARATION OF LEAD ISOTOPES FOR SAFE NUCLEAR POWER REACTORS -- ABSTRACT -- 1. INTRODUCTION -- 2. METHODS OF LASER ISOTOPE SEPARATION -- 3. SELECTIVE EXCITATION OF THE METASTABLE LEVELS OF LEAD -- 4. EXPERIMENTAL AND APPROACH -- 5. RESULTS AND DISCUSSION -- CONCLUSION -- REFERENCES -- ASSESSMENT OF SPECIFIC COST OF HIGHLY ENRICHED LEAD-208 ISOTOPE BY GAS CENTRIFUGES USING VARIOUS RAW MATERIALS -- ABSTRACT -- DESIGNATION -- INTRODUCTION -- THEORETICAL BACKGROUND -- DISCUSSION -- Enrichment from the Natural Lead Isotope Mixture -- Enrichment from the Radiogenic Lead -- CONCLUSION -- REFERENCES -- METHOD FOR OBTAINING ISOTOPICALLY ENRICHED METAL LEAD FROM MONOISOTOPIC TETRAMETHYLLEAD AND ITS PURIFICATION -- ABSTRACT -- 1. INTRODUCTION -- 2. SYNTHESIS OF $Pb(CH_3)_4$ -- 3. CONVERSION OF ISOTOPE-ENRICHED PBTO METALLIC LEAD $208(CH_3)_4$ -- 4. PURIFICATION OF ISOTOPICALLY ENRICHED METALLIC LEAD -- CONCLUSION -- REFERENCES -- INDEX.

Sommario/riassunto

The book provides an overview of the advantages in using lead enriched with stable lead isotope lead-208 instead of natural lead as a coolant of fast reactors (FRs) and accelerator driven systems (ADS). Lead-208 as a twice magic nucleus has low cross sections of neutron radiation capture and small moderation of neutrons in the range of neutron energies 10 eV 20 MeV, i.e. in FR and ADS core neutron spectra. These unique features of lead-208 lead to the economy of neutrons, hardening the neutron spectra and other profitable factors.