



ISSN 1000-6931

CN 11-2044/TL

YUANZINENG KEXUE JISHU

# 原子能科学技术

中国原子能科学研究院

2019 8 (第 53 卷)

ATOMIC ENERGY SCIENCE  
AND TECHNOLOGY

ISSN 1000-6931



9 771000 693196

## 目 次

**物理**

- 高能评价核数据处理方法 ..... 张环宇, 刘 萍, 吴海成(1345)

**化学**

- 壳聚糖-生物炭复合材料对 U(VI)的吸附性能试验研究 ..... 高 翔, 谢水波, 刘迎久, 曾涛涛, 莫官海(1350)

- 聚丙烯腈基钛酸钾球形复合吸附剂的制备及其对  $\text{Sr}^{2+}$  的吸附性能研究 ..... 杜志辉, 贾铭椿, 王晓伟, 门金凤(1359)

- 氟在 RAFM 钢表面的吸附研究 ..... 陆光达, 向 鑫, 张桂凯, 范东军, 包锦春, 陈长安, 唐 涛(1367)

- 制备工艺对铀烧绿石基玻璃陶瓷固化体结构及性能的影响 ..... 冯志强, 谢 华, 王烈林, 邓司浩(1376)

- 不同地浸采铀工艺主要元素迁移强度与饱和状态研究 ..... 吉宏斌, 孙占学, 周义朋, 阳奕汉(1386)

**反应堆工程**

- 低压自然循环复合流量脉动实验研究 ..... 陈先兵, 高璞珍, 邹 犁, 谷韫丰(1394)

- 脉动流下棒束通道内相位差及瞬态流场研究 ..... 李 兴, 郭沛垚, 谭思超, 郝思佳, 米争鹏(1402)

- 一体化小型自然循环反应堆流动非对称性机理分析 ..... 廉海波, 姜胜耀, 李胜强, 朱宏晔, 杨星团(1410)

- 小型模块化钠冷快堆非能动余热排出系统分析研究 ..... 陈振佳, 杨红义, 余华金, 侯 斌, 朱丽娜(1417)

- 快堆带绕丝棒束组件低雷诺数下的水力特性分析 ..... 程道喜, 齐晓光, 杜开文, 翟伟明(1424)

- 传热管流致振动设计准则比较 ..... 王 聪, 陆道纲, 曹 琼, 王园鹏(1433)

- 超临界二氧化碳模块化微型堆瞬态安全分析 ..... 李登伟, 肖 瑶, 顾汉洋(1439)

- 示范快堆堆芯熔融物收集装置的安全分析 ..... 刘兆阳, 胡靖东, 宫建国, 曹 健, 高付海, 轩福贞(1445)

- 小型可运输长寿命铅铋冷却快堆堆芯设计研究 ..... 雷 驰, 吴宏春, 曹良志, 周生诚, 邵一穷(1451)

- 空间气冷堆堆芯初步物理特性分析 ..... 孟 涛, 赵富龙, 程 坤, 何宇豪, 谭思超(1459)

- 钍铀燃料循环专用核数据库 CENDL-TMSR-V1 的基准检验 ..... 王小鹤, 胡继峰, 陈金根, 蔡翔舟, 韩建龙(1466)

- 燃料破损在线探测系统在核电厂的应用与分析 ..... 徐西安, 季松涛, 杨 毅(1475)

- 人因可靠性分析方法在核电厂调峰运行背景下的适用性研究 ..... 刘雪阳, 张 力, 邹衍华, 陈 帅, 洪 俊(1481)

**技术及应用**

- 基于 FPGA 的高性能坎贝尔积分算法研究 ..... 刘子豪, 周 翔, 朱仁杰, 阴泽杰(1488)

- 基于能谱重建技术的全身计数器  $\gamma$  能谱分析 ..... 赵 日, 刘立业, 曹勤剑(1495)

基于缓发  $\gamma$  能谱测量的铀丰度分析 … 田晨扬,过惠平,欧阳晓平,姚青旭,张立波,白德平,焦东明,田庆云(1502)

兆安级电流下 Al 丝阵的芯晕结构抑制研究 .....

..... 张金海,邱爱慈,王亮平,李沫,孙铁平,李阳,丛培天,盛亮(1509)

120 MeV 电子直线加速器在线自动老练系统研制 .....

..... 孙彬,王煜,黑东炜,李斌康,谭新建,翁秀峰,付竹明,刘军(1517)

高能同步辐射光源高精度直流稳流电源样机研制 .....

郭晓玲,刘鹏,韩超,陈斌(1523)

核材料炸药化学爆炸条件下烟云源项的实验与仿真 .....

段中山,过惠平,罗永锋,罗昆升,尚爱国,龚朋彬(1530)

**期刊基本参数:** CN 11-2044/TL \* 1959 \* m \* A4 \* 192 \* zh \* P \* ¥40.00 \* 1200 \* 26 \* 2019-08

**本期责任编辑** 王宝金 马英霞 王调霞 侯翠梅 汤晓浩 张秀平 韩翠娥

# ATOMIC ENERGY SCIENCE AND TECHNOLOGY

Vol. 53, No. 8

Aug. 2019

## CONTENTS

### PHYSICS

- Processing Method for High Energy Evaluated Nuclear Data .....  
..... ZHANG Huanyu, LIU Ping, WU Haicheng(1345)

### CHEMISTRY

- Experimental Investigation on Adsorption of U(VI) by Chitosan-biochar Composite .....  
..... GAO Xiang, XIE Shuibo, LIU Yingjiu, ZENG Taotao, MO Guanhui(1350)
- Preparation of Polyacrylonitrile-potassium Titanate Spherical Composite Adsorbents and Their Adsorption Properties for Sr<sup>2+</sup> ..... DU Zhihui, JIA Mingchun, WANG Xiaowei, MEN Jinfeng(1359)
- Tritium Adsorption Property on RAFM Steel Surface .....  
..... LU Guangda, XIANG Xin, ZHANG Guikai, FAN Dongjun, BAO Jinchun, CHEN Chang'an, TANG Tao(1367)
- Effect of Preparation Process on Structure and Property of Uranium Pyrochlore-based Glass-ceramics Waste From .....  
..... FENG Zhiqiang, XIE Hua, WANG Lielin, DENG Siha(1376)
- Research on Migration Intensity and Saturation State of Main Element in Different In-situ Leaching of Uranium Processes ..... JI Hongbin, SUN Zhanxue, ZHOU Yipeng, YANG Yihan(1386)

### REACTOR ENGINEERING

- Experimental Investigation of Compound Flow Oscillation under Low Pressure Natural Circulation .....  
..... CHEN Xianbing, GAO Puzhen, ZOU Chong, GU Yunfeng(1394)
- Study on Phase Difference and Transient Flow Field in Rod Bundle under Pulsating Flow .....  
..... LI Xing, QI Peiyao, TAN Sichao, HAO Sijia, MI Zhengpeng(1402)
- Analysis of Asymmetry Flow in Integrated Small Natural Circulation Reactor .....  
..... LIAN Haibo, JIANG Shengyao, LI Shengqiang, ZHU Hongye, YANG Xingtuan(1410)
- Design and Analysis of Passive Decay Heat Removal System for Sodium-cooled Small Modular Reactor .....  
..... CHEN Zhenjia, YANG Hongyi, YU Huajin, HOU Bin, ZHU Lina(1417)
- Numerical Analysis of Hydraulic Characteristic of Fast Reactor Wire-wrapped Rod Bundle Assembly under Low Reynolds Number ..... CHENG Daoxi, QI Xiaoguang, DU Kaiwen, ZHAI Weiming(1424)
- Comparison of Design Criteria for Flow-induced Vibration of Heat-exchange Tube .....  
..... WANG Cong, LU Daogang, CAO Qiong, WANG Yuanpeng(1433)
- Transient-state Safety Analysis of Supercritical CO<sub>2</sub>-cooled Micro-modular Reactor .....  
..... LI Dengwei, XIAO Yao, GU Hanyang(1439)
- Safety Analysis of Demonstration Fast Reactor Core Melt Collector .....  
..... LIU Zhaoyang, HU Jingdong, GONG Jianguo, CAO Jian, GAO Fuhai, XUAN Fuzhen(1445)

- Core Design Study of Small Transportable Long-life Lead-bismuth Cooled Fast Reactor .....  
..... LEI Chi, WU Hongchun, CAO Liangzhi, ZHOU Shengcheng, SHAO Yiqiong(1451)
- Preliminary Physics Analysis of Space Gas-cooled Nuclear Reactor .....  
..... MENG Tao, ZHAO Fulong, CHENG Kun, HE Yuhao, TAN Sichao(1459)
- Benchmark Test of CENDL-TMSR-V1 Nuclear Data Library for Thorium-uranium Fuel Cycle .....  
..... WANG Xiaohe, HU Jifeng, CHEN Jinggen, CAI Xiangzhou, HAN Jianlong(1466)
- Application and Analysis of On-line Fuel Damage Detection System in Nuclear Power Plant .....  
..... XU Xi'an, JI Songtao, YANG Yi(1475)
- Applicability Research of Human Reliability Analysis Method under Background of Peak-shaving Operation in Nuclear Power Plant ..... LIU Xueyang, ZHANG Li, ZOU Yanhua, CHEN Shuai, HONG Jun(1481)

## **TECHNIQUES AND APPLICATIONS**

- Research on High Performance Campbell Algorithm Based on FPGA .....  
..... LIU Zihao, ZHOU Xiang, ZHU Renjie, YIN Zejie(1488)
- $\gamma$  Spectrum Analysis Based on Reconstruction Technology for Whole Body Counter .....  
..... ZHAO Ri, LIU Liye, CAO Qinjian(1495)
- Analysis of Uranium Enrichment Based on Delayed Gamma Spectrum Measurement .....  
..... TIAN Chenyang, GUO Huiping,  
..... OUYANG Xiaoping, YAO Qingxu, ZHANG Libo, BAI Deping, JIAO Dongming, TIAN Qingyun(1502)
- Study on Core-corona Suppression of Aluminum Wire Array with Megampere Current .....  
..... ZHANG Jinhai, QIU Aici, WANG Liangping, LI Mo, SUN Tieping, LI Yang, CONG Peitian, SHENG Liang(1509)
- Development of Online Automatic Conditioning System in 120 MeV Electron Linear Accelerator .....  
..... SUN Bin, WANG Yu, HEI Dongwei, LI Binkang, TAN Xinjian, WENG Xiufeng, FU Zhuming, LIU Jun(1517)
- Development of High Precision and Stability DC Power Supply Prototype for High Energy Photon Source .....  
..... GUO Xiaoling, LIU Peng, HAN Chao, CHEN Bin(1523)
- Experiment and Simulation of Cloud Source Term of Nuclear Material Produced by High-explosive Detonation ...  
..... DUAN Zhongshan, GUO Huiping, LUO Yongfeng, LUO Kunsheng, SHANG Aiguo, GONG Pengbin(1530)
- Editors** WANG Baojin, MA Yingxia, WANG Tiaoxia, HOU Cuimei, TANG Xiaohao, ZHANG Xiuping, HAN Cuie