

原子能科学技术

ATOMIC ENERGY SCIENCE AND TECHNOLOGY

NO. 7 2021
第55卷

FeCu合金中Cu析出物导致硬化的位错动力学研究

滕明航, 贺新福, 豆艳坤, 王东杰, 贾丽霞

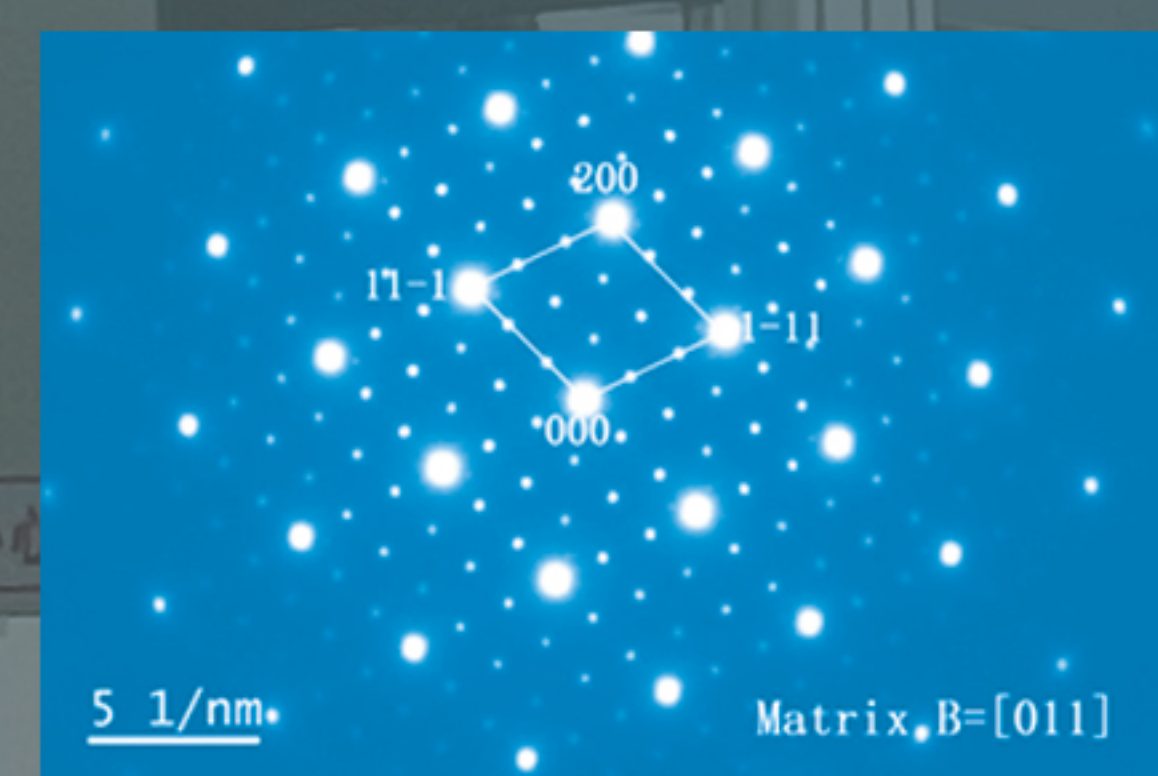
材料辐照损伤多尺度模拟预测平台及应用

发现 / 探明
物理机制及建立模型

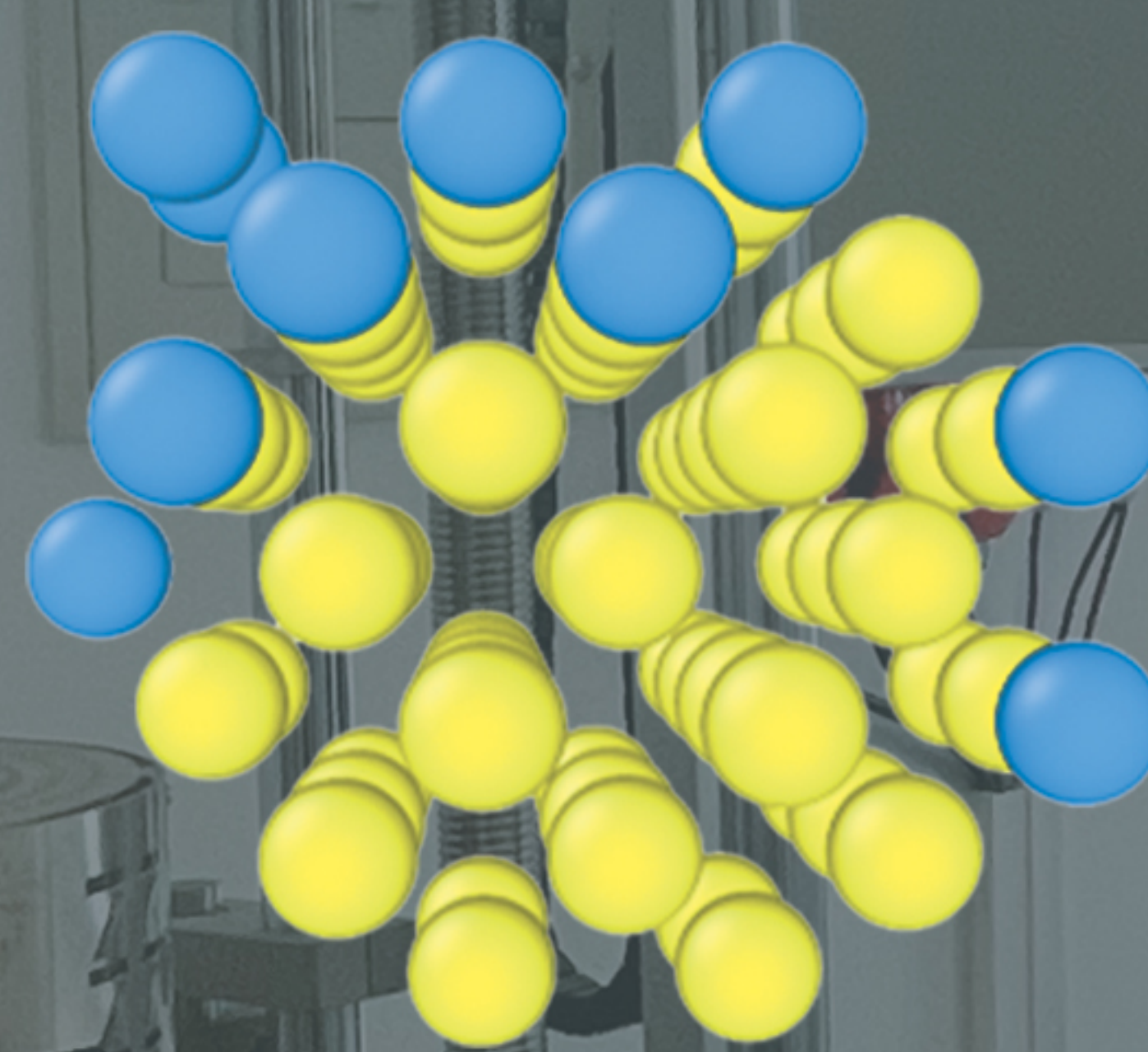
建立“微观-介观-宏观”
跨尺度关联模型

实验验证
及数据挖掘

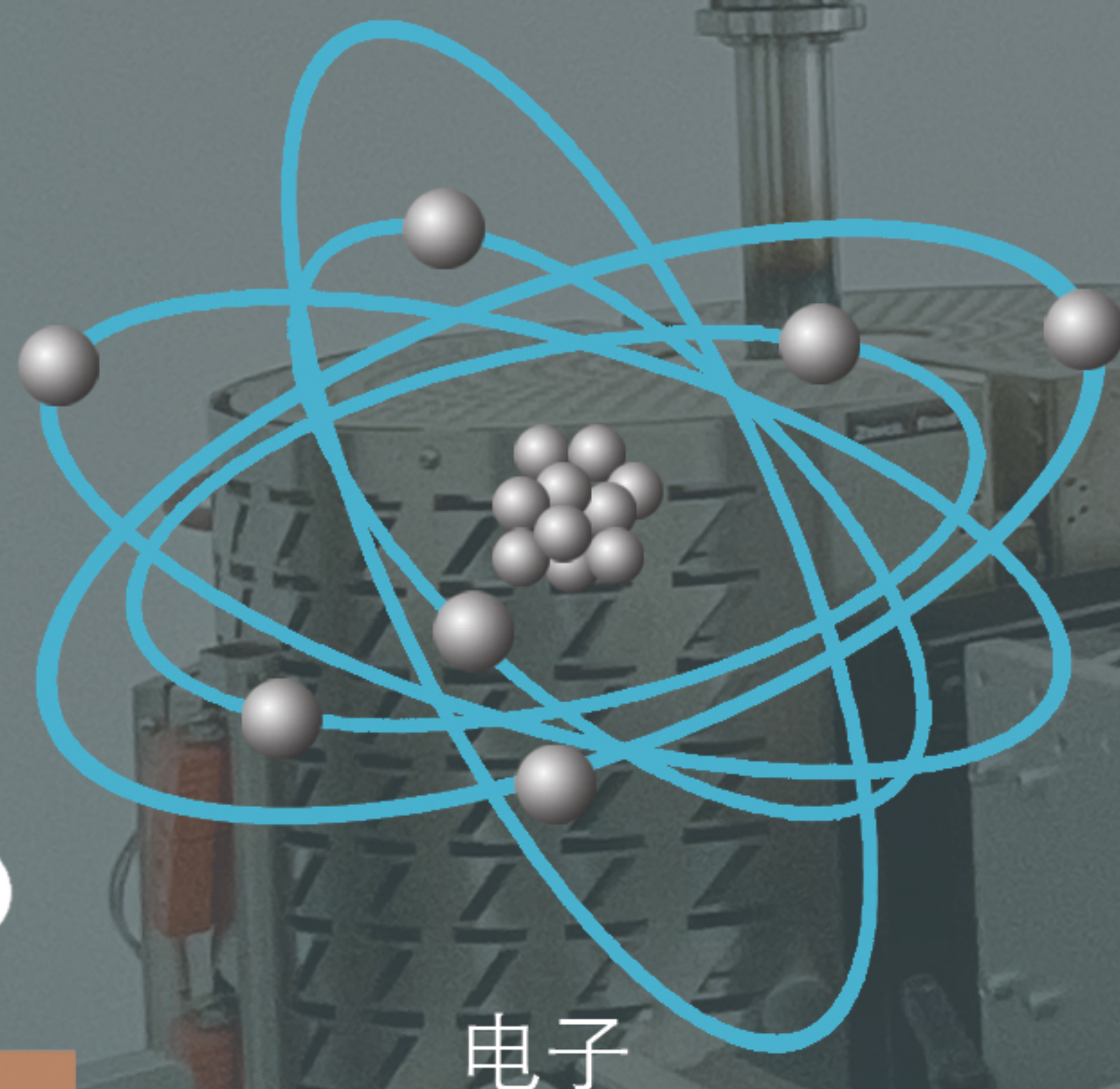
“宏观→介观→微观”实验



介观尺度



原子团簇



电子

“微观→介观→宏观”模拟

ISSN 1000-6931



9 771000 693219

中国原子能科学研究院 主办
中国核工业集团有限公司 主管

目 次

反应堆材料辐照损伤专栏

- 序言 贺新福(I)
- FeCu 模型合金中 Cu 析出物导致硬化的位错动力学研究 滕明航,贺新福,豆艳坤,王东杰,贾丽霞(1153)
- 基于 W 型试样确定 A508-III 钢参考温度 T_0 的方法研究
..... 宁广胜,林 虎,钟巍华,张长义,刘 健,杨 文(1163)
- 国产反应堆压力容器的辐照脆化行为及预测 林 虎,钟巍华,佟振峰,宁广胜,张长义,杨 文(1170)
- 国产 A508-3 钢小尺寸拉伸样品的拉伸颈缩行为研究 杨万欢,钟巍华,黎军硕,李 帅,宁广胜,杨 文(1177)
- 基于深度神经网络的 ODS 合金辐照硬化预测 白 冰,韩 煦,曹 晗,柯艺璇,贺新福,杨 文(1184)
- 镧系裂变产物(La、Ce、Pr 和 Nd)在 α -U 表面偏析行为的第一原理研究
..... 曹金利,王志超,王 瑾,豆艳坤,贺新福,杨 文(1191)
- α -Fe 中刃型位错和富 MnNi 析出物相互作用的分子动力学模拟研究
..... 豆艳坤,黄楚天,王东杰,贺新福,贾丽霞,王 瑾,曹金利(1200)
- BCC-Fe 中螺位错与[010]间隙位错环相互作用分子动力学模拟
..... 王 瑾,贺新福,曹 晗,王东杰,豆艳坤,杨 文(1210)
- 核材料辐照损伤的并行空间分辨随机团簇动力学模拟 陈丹丹,贺新福,杨 文,储根深,白 鹤,胡长军(1219)
- 指数时间差分方法在材料辐照损伤模拟计算中的应用 辛之乔,聂宁明,贺新福,王彦桐,吴 石,王 珏(1230)
- 非均匀形核对辐照诱导钨内微结构演化行为影响的团簇动力学模拟
..... 吴 石,刘丽霞,邓辉球,贺新福,王东杰,曹金利,杨 文(1241)

化学

- 尿素¹⁴C胶囊中⁵⁵Fe分析方法研究 马莉娜,宋丽娟,杨永刚,王亚东,马 彦,戴雄新(1253)

反应堆工程

- RELAP5 铅铋快堆模型拓展及验证 张家心,王成龙,赵寒冰,张大林,苏光辉,秋穗正,田文喜(1260)
- 蒸汽发生器试验本体快速冷却过程中主蒸汽法兰泄漏有限元分析
..... 刘 吉,李晓伟,吴莘馨,赵加清,雒晓卫(1268)
- 基于虚拟体积力动量源的燃料组件热工水力数值求解方法
..... 李小畅,邓 坚,杨小磊,郭涌辉,陈广亮,田瑞峰(1276)
- 液态金属螺旋管式直流蒸汽发生器数值模拟研究 杨宇鹏,王成龙,张大林,苏光辉,田文喜,秋穗正(1288)

基于 MOOSE 平台的棒状燃料元件性能分析程序开发与验证
 邓超群,向烽瑞,贺亚男,牛钰航,巫英伟,田文喜,秋穗正,苏光辉(1296)

基于 OpenFOAM 的 5×5 棒束流动数值模拟 黄瑀琦,蔡杰进(1304)

不同参数对 U 型管式蒸汽发生器倒流影响的实验研究.....
 刘 浩,马在勇,姜张锐,唐 瑜,张卢腾,徐建军,孙 皖,袁德文,潘良明(1309)

HWRR 屏蔽层活化源项研究 李睿之,孙世乔,周一东,张立军,张生栋(1316)

技术及应用

新型耐高温中子屏蔽复合材料的设计制备及性能研究 龚军军,陈志刚,黄颂新,门金凤(1323)

基于核试验监测数据的模拟 γ 能谱分析国际能力验证 ... 王世联,王 军,李 奇,樊元庆,张新军,贾怀茂(1331)

并联六自由度主动减振平台解耦控制策略研究
 刘仁洪,王广源,康 玲,余洁冰,刘 磊,贺华艳,张俊嵩(1338)

期刊基本参数: CN 11-2044/TL * 1959 * m * A4 * 192 * zh * P * ¥40.00 * 1200 * 23 * 2021-07

本期责任编辑 汤晓浩 王调霞 王宝金 侯翠梅 张秀平 韩翠娥

CONTENTS

COLUMN OF IRRADIATION DAMAGE IN REACTOR MATERIALS

Preface HE Xinfu(I)

Cu Precipitate Induced Hardening in FeCu Model Alloy by Dislocation Dynamics
 TENG Minghang, HE Xinfu, DOU Yankun, WANG Dongjie, JIA Lixia(1153)

Test Method for T_0 of Domestic A508-III Steel by Using W-shaped Specimen
 NING Guangsheng, LIN Hu, ZHONG Weihua, ZHANG Changyi, LIU Jian, YANG Wen(1163)

Irradiation Embrittlement Behavior and Prediction of Domestic Reactor Pressure Vessel
 ... LIN Hu, ZHONG Weihua, TONG Zhenfeng, NING Guangsheng, ZHANG Changyi, YANG Wen(1170)

Necking Behavior of Small Tensile Specimen of Domestic A508-3 Steel
 YANG Wanhuan, ZHONG Weihua, LI Junwan, LI Shuai, NING Guangsheng, YANG Wen(1177)

Radiation Hardening Prediction for ODS Alloy Based on Deep Neural Network
 BAI Bing, HAN Xu, CAO Han, KE Yixuan, HE Xinfu, YANG Wen(1184)

Segregation of Ln Fission Product (La, Ce, Pr and Nd) on Surface of α -U from First-principle
 CAO Jinli, WANG Zhichao, WANG Jin, DOU Yankun, HE Xinfu, YANG Wen(1191)

Molecular Dynamics Simulation of Interaction between Edge Dislocation and MnNi-rich Precipitate in α -Fe
 DOU Yankun, HUANG Chutian, WANG Dongjie, HE Xinfu, JIA Lixia, WANG Jin, CAO Jinli(1200)

Molecular Dynamics Simulation on Interaction between Screw Dislocation and [010] Interstitial Dislocation Loop in
 BCC-Fe WANG Jin, HE Xinfu, CAO Han, WANG Dongjie, DOU Yankun, YANG Wen(1210)

Parallel Spatially Resolved Stochastic Cluster Dynamics Simulation of Radiation Damage in Nuclear Material
 CHEN Dandan, HE Xinfu, YANG Wen, CHU Genshen, BAI He, HU Changjun(1219)

Application of Exponential Time Difference Method in Simulation Calculation of Material Irradiation Damage
 XIN Zhikuang, NIE Ningming, HE Xinfu, WANG Yangang, WU Shi, WANG Jue(1230)

Influence of Inhomogeneity Nucleation on Radiation-induced Microstructural Evolution in Tungsten by Cluster
 Dynamics Method
 WU Shi, LIU Lixia, DENG Huiqiu, HE Xinfu, WANG Dongjie, CAO Jinli, YANG Wen(1241)

CHEMISTRY

Method for Determination of ^{55}Fe in Urea ^{14}C Capsule
 MA Lina, SONG Lijuan, YANG Yonggang, WANG Yadong, MA Yan, DAI Xiongxin(1253)

REACTOR ENGINEERING

RELAP5 Modification and Verification for Lead-bismuth Fast Reactor ZHANG Jiaxin,
 WANG Chenglong, ZHAO Hanbing, ZHANG Dalin, SU Guanghui, QIU Suizheng, TIAN Wenxi(1260)

Finite Element Analysis of Main Steam Header Flange Leakage of Test Steam Generator during Fast-cooling Process
 万方数据 LIU Ji, LI Xiaowei, WU Xinxin, ZHAO Jiaqing, LUO Xiaowei(1268)

Method of Simulating Thermal-hydraulic Behavior of Fuel Assembly Based on Virtual Body Force Momentum Source
 LI Xiaochang, DENG Jian, YANG Xiaolei, GUO Yonghui, CHEN Guangliang, TIAN Ruifeng(1276)

Numerical Study of Liquid Metal Helical Coil Once-through Tube Steam Generator
 YANG Yupeng, WANG Chenglong, ZHANG Dalin, SU Guanghui, TIAN Wenxi, QIU Suizheng(1288)

Development and Validation of Fuel Rod Performance Analysis Code Based on MOOSE Platform
 DENG Chaoqun,
 XIANG Fengrui, HE Yanan, NIU Yuhang, WU Yingwei, TIAN Wenxi, QIU Suizheng, SU Guanghui(1296)

Numerical Simulation of 5×5 Rod Bundle Flow Based on OpenFOAM HUANG Yuqi, CAI Jiejun(1304)

Experimental Research on Effect of Different Parameters on Reverse Flow of U-tube Steam Generator
 LIU Hao, MA Zaiyong,
 JIANG Zhangrui, TANG Yu, ZHANG Luteng, XU Jianjun, SUN Wan, YUAN Dewen, PAN Liangming(1309)

Study on Source Term in Shielding Layer of HWRR
 LI Ruizhi, SUN Shiqiao, ZHOU Yidong, ZHANG Lijun, ZHANG Shengdong(1316)

TECHNIQUES AND APPLICATIONS

Design, Preparation and Property Study of New High Temperature Resistant Neutron Shielding Composite
 GONG Junjun, CHEN Zhigang, HUANG Songxin, MEN Jinfeng(1323)

International Proficiency Test of Stimulated γ -ray Spectrum Analysis Based on Nuclear Test Monitoring Data ...
 WANG Shilian, WANG Jun, LI Qi, FAN Yuanqing, ZHANG Xinjun, JIA Huaimao(1331)

Research on Decoupling Control Strategy of Parallel 6-DOF Active Vibration Control Platform
 LIU Renhong, WANG Guangyuan, KANG Ling, YU Jiebing, LIU Lei, HE Huayan, ZHANG Junsong(1338)

Editors TANG Xiaohao, WANG Tiaoxia, WANG Baojin, HOU Cuimei, ZHANG Xiuping, HAN Cuie