

主管单位: 中华人民共和国应急管理部  
主办单位: 应急管理部天津消防研究所  
中国标准连续出版物号: CN 12-1311/TU

中文核心期刊·中国科技核心期刊

# 消防科学与技术®

XIAOFANG KEXUE YU JISHU

(月刊·1982年创刊)

2022年第6期(总第41卷第327期)

## 目次

### 《消防科学与技术》编辑委员会

主任: 周天

副主任: 范维澄(院士) 王玉忠(院士)

委员:(按姓氏笔画为序)

元英进 方正 东靖飞 戎贤  
朱国庆 刘程 刘乃安 闫胜利  
孙金华 孙金杰 李国强 李炎锋  
汪永明 宋波 张全灵 张昊  
袁宏永 高宁宇 徐放 徐志胜  
黄晓家 蒋军成 薛林  
罗伯特·迪尔托普(英国)  
托马斯·莱昂纳特(德国)

### 《消防科学与技术》编辑部

总编辑: 宋波

常务副总编辑: 鲁志宝

副总编辑: 余威

主编: 邱培芳

常务副主编: 马建琴

副责任编辑: 王钢兵 陈邢秀军 董里

责任编辑: 梁星 邢玉军 董里

毛星 李艳娜

编辑: 杜玉龙 彭燕华

编辑出版:

《消防科学与技术》编辑部

编辑部地址: 天津市南开区卫津南路110号

邮政编码: 300381

编辑部电话: (022)23383612 23920225

传真: (022)23387274

电子信箱: fire@xfkj.com.cn

网址: http://www.xfkj.com.cn

广告发行部电话: (022)23387276

电子信箱: guanggao@xfkj.com.cn

国内发行: 《消防科学与技术》编辑部

国外发行: 中国国际图书贸易集团有限公司

国外发行代号: M1508

印刷: 天津渤海化学股份有限公司

出版日期: 2022年6月15日

发行范围: 国内外公开发刊

定价: 40.00元/册 480.00元/全年

国外定价: 15.00美元/册

准予广告发布登记: 002号

本刊发表全部文章和图片版权均属《消防科学与技术》编辑部所有,如需转载请与本刊编辑部联系,未经授权不得以任何形式转载。

#### 消防理论研究

- 气凝胶毡组合放置方式对锂离子电池热失控特性的影响……………刘全义、朱倩、朱文田,等(727)
- 尿素抑制甲烷爆炸关键基元反应机理研究……………张庆利、李孝斌、张瑞杰,等(732)
- 稻壳粉尘着火敏感性试验研究……………熊静文、叶亚明、蒋代,等(735)
- 变电站站用电系统混合型负荷支路的漏电监测方法……………陈昊、崔运光、马兆兴,等(739)
- 砂子基底正庚烷流淌火特性及传热分析……………张康、张小翠、李海航,等(744)
- 低沸点易燃液体火灾扑救难点及技术对策……………包志明、陈旻、张宪忠,等(749)
- 堆积尺寸对秸秆燃烧特性影响的实验研究……………杜伟、程海涛、邹彪,等(753)
- 基于ICEEMD样本熵分析的管道多点泄漏定位……………杨健、吴雨佳、许宁,等(757)
- 储罐爆炸事故碎片抛射距离简易预测模型……………朱明辉、武成杰(763)
- 大型船用高倍泡沫发生器参数设计及试验研究……………汪月勇、乐智斌、邱波,等(767)

#### 建筑防火设计

- 装配式钢结构模块连接节点耐火性能试验研究……………黄益良、彭磊、薛岗,等(772)
- 倾斜导烟板对隧道机械排烟效果影响研究……………季经纬、李福清、卢文,等(777)
- 海底特长隧道利用横通道控烟技术研究……………游温娇、仲生军(782)
- 钢板加固高温后钢筋混凝土梁抗弯性能研究……………段文峰、李丹、卞博,等(786)

#### 灭火系统设计

- 纵向风速对隧道细水雾灭火效果影响探讨……………张奥宇、邓敏(792)
- 机械立体车库自动喷水灭火系统水力计算方法及其应用……………尹桂旭、莫慧、杨丹(797)
- 细水雾灭火系统在小型车库火灾中的灭火效能试验研究……………彭锦志(802)

#### 消防设备研究

- 基于目标检测卷积神经网络的图像型火灾探测算法……………张苗、李璞、杨漪,等(807)
- 燃气输配突发事件应急处置的知识图谱构建……………李思洁、王亚慧、张子豪(812)

#### 灭火剂与阻燃材料

- 镁系无机刨花板热压工艺与阻燃性能研究……………王君哲、牛耕芜、卢俊辉,等(818)
- 自发热货物标准测试方法对偶氮类染料粉末适用性……………王高俊、吴昊、聂文磊(823)

#### 森林火灾防控

- 高压输电线路断线垂落故障引发典型植被燃烧特性……………周恺、张睿哲、赵耀鹏,等(827)
- 华南地区森林地表可燃物火蔓延速度特性的实验研究……………冯俊伟(832)
- 长白山地区常见阔叶树种有机质燃烧特性研究……………周勇、章林、于春波,等(836)
- 基于GIS的凉水国家级自然保护区林火应急路网规划研究……………袁铭鞠、卢照林、周远,等(841)

#### 应急管理研究

- 车辆事故救援中风险分析及对策研究……………申睿、秦立朋、陈海涛(847)
- 消防员职业损伤因子及对策研究……………董凯、朱国庆、宋春景,等(851)
- 化工企业火灾爆炸事故特性及对策建议……………吕彦杰(856)

#### 火灾调查研究

- 低压电路接触不良断路电弧引燃能力实验研究……………王伟峰、刘强、张方智,等(860)
- 过电流导线引燃周围可燃物特性研究……………陈奕霖、梁栋、高殿策(864)
- 一起刀片电池因撞击受潮起火事故的调查……………黄文晓(869)

# Fire Science and Technology

(monthly)

Founded in 1982

Vol.41, No.6, June 2022

**Unit in Charge:** Ministry of Emergency Management of the People's Republic of China

**Sponsor:** Tianjin Fire Science and Technology Research Institute of MEM

**Editorial Board**

**Director:** Zhou Tian

**Vice Director:** Fan Weicheng (Academician), Wang Yuzhong (Academician)

**Editorial Office**

**Editor-in-Chief:** Song Bo

**Executive Editor-in-Chief:** Ku Zhibao

**Assistant Editor-in-Chief:** Yu Wei

**Chief Editor:** Qiu Peifang

**Executive Chief Editor:** Ma Jianqin

**Assistant Chief Editor:** Wang Wangang, Chen Fang

**Executive Editors:** Liang Bing, Xing Yujun, Dong Li, Mao Xing, Li Yanna

**Editors:** Du Yulong, Peng Yanhua

**Publisher:** Editorial Office of Fire Science and Technology

**Add:** 110 South Weijin Road, Tianjin 300381, China

**Tel:** (86-22)23383612/23920225

**Fax:** (86-22)23387274

**E-mail:** fire@xfkj.com.cn

**URL:** <http://www.xfkj.com.cn>

**Advertisement/Distribution Department**

**Tel:** (86-22)23387276

**E-mail:** guanggao@xfkj.com.cn

**Domestic Distributor:** Editorial Office of Fire Science and Technology

**Overseas Distributor:** China International Book Trading Corporation (M1508)

**CSSN:** ISSN 1009-0029

**CSSN:** CN 12-1311/TU

**Publishing Date:** 2022-06-15

**Price:** ¥40.00

**Overseas Price:** \$ 15.00

## CONTENTS

### Fire theory study

- Effect of the combined placement of aerogel felts on the thermal runaway characteristics of lithium-ion batteries ..... LIU Quan-yi, ZHU Qian, ZHU Wen-tian, *et al.*(727)
- Study on the key element reaction of urea inhibition of methane explosion ..... ZHANG Qing-li, LI Xiao-bin, ZHANG Rui-jie, *et al.*(732)
- Experimental study on ignition sensitivity of rice husk dust ..... XIONG Jing-wen, YE Ya-ming, JIANG Dai, *et al.*(735)
- Leakage monitoring method of hybrid load branch of the self-using power system in substation ..... CHEN Hao, CUI Yun-guang, MA Zhao-xing, *et al.*(739)
- Characteristics and heat transfer analysis of n-heptane spill fire on sand base ..... ZHANG Kang, ZHANG Xiao-cui, LI Hai-hang, *et al.*(744)
- Difficulty in fire fighting of flammable liquid with low boiling point and the fire extinguishing technical countermeasures ..... BAO Zhi-ming, CHEN Yang, ZHANG Xian-zhong, *et al.*(749)
- Experimental study on the influence of cumulated dimensions on the combustion characteristics of straw ..... DU Wei, CHENG Hai-tao, ZOU Biao, *et al.*(753)
- Locating of multi-point leakage in pipeline based on ICEEMD sample entropy ..... YANG Jian, WU Yu-jia, XU Ning, *et al.*(757)
- A simple prediction model for the flight distance of fragments in storage tank explosions ..... ZHU Ming-hui, WU Chen-jie(763)
- Parameters and experimental research of high expansion foam generator for large ships ..... WANG Yue-yong, LE Zhi-bin, QIU Bo, *et al.*(767)

### Building fire protection design

- Experimental study on fire resistance of connections in prefabricated modular steel structures ..... HUANG Yi-liang, PENG Lei, XUE Gang, *et al.*(772)
- Influence of inclined smoke deflector on mechanical smoke exhaust effect of tunnel ..... JI Jing-wei, LI Fu-qing, LU Wen, *et al.*(777)
- Study on smoke control technology by using cross passage in extra-long submarine tunnel ..... YOU Wen-jiao, ZHONG Sheng-jun(782)
- Research on flexural performance of reinforced concrete beams strengthened by steel plate after high temperature ..... DUAN Wen-feng, LI Dan, BIAN Bo, *et al.*(786)

### Design of fire extinguishing system

- Discussion on influence of longitudinal wind speed on fire extinguishing effect of water mist system in tunnel ..... ZHANG Ao-yu, DENG Min(792)
- Hydraulic calculation method and application of sprinkler system in mechanical garage ..... YIN Gui-Xu, MO Hui, YANG Dan(797)
- Experimental study on fire-extinguishing efficiency of water mist fire-extinguishing system in small car garage fire ..... PENG Jin-zhi(802)

### Study of fire equipment

- Image fire detection algorithms based on object detection convolutional neural networks ..... ZHANG Miao, LI Pu, YANG Yi, *et al.*(807)
- Construction of knowledge graph for emergency disposal of gas transmission and distribution emergencies ..... LI Si-jie, WANG Ya-hui, ZHANG Zi-hao(812)

### Extinguishant and flame retardant material

- Study on hot pressing process and flame retardancy of magnesium inorganic particleboard ..... WANG Jun-zhe, NIU Geng-wu, LU Jun-hui, *et al.*(818)
- Applicability of standard test method for self-heating goods to azo-dye powder ..... WANG Gao-jun, WU Hao, NIE Wen-lei(823)

### Forest fire control

- Characteristics and main influential factors of igniting typical forest vegetation materials by faults of simulated broken and fallen segments of high voltage transmission lines ..... ZHOU Kai, ZHANG Rui-zhe, ZHAO Yao-peng, *et al.*(827)
- Experimental study on fire spread rate characteristics of forest surface fuels in South China ..... FENG Jun-wei(832)
- Study on the burning characteristics of organic matter in leaves and bark of common broad-leaved tree species in Changbai Mountains ..... ZHOU Yong, ZHANG Lin, YU Chun-bo, *et al.*(836)
- Research on forest fire emergency road network planning of Liangshui National Nature Reserve based on GIS technology ..... YUAN Ming-ju, LU Zhao-lin, ZHOU Yuan, *et al.*(841)

### Emergency management study

- Risk analysis and countermeasure research in vehicle accident rescue ..... SHEN Rui, QIN Li-peng, CHEN Hai-tao(847)
- Research on occupational injury factors of firefighters and countermeasures ..... DONG Kai, ZHU Guo-qing, SONG Chun-jing, *et al.*(851)
- Characteristics and countermeasures of fire and explosion accidents in chemical enterprises ..... LV Yan-jie(856)

### Fire investigation and analysis

- Experimental research on arc ignition ability of low-voltage circuit with poor contact ..... WANG Wei-feng, LIU Qiang, ZHANG Fang-zhi, *et al.*(860)
- Study on characteristics of overloaded wires igniting surrounding combustibles ..... CHEN Yi-lin, LIANG Dong, GAO Dian-ce(864)
- Investigation of a blade battery fire caused by impingement and damp ..... HUANG Wen-xiao(869)