

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

## 《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)

王中铮 元莫进 方正 东靖飞  
代旭日 戎贤 朱国庆 闫胜利  
孙金华 孙金杰 李国强 李炎锋  
闵永林 汪永明 宋波 张全灵  
张昊 赵长征 袁宏永 高宁宇  
徐放 徐志胜 黄晓家 梁栋  
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:肖磊

副总编辑:余威

主编:邱培芳

常务副主编:马建琴

副主编:王钢 陈那芳 董里

责任编辑:梁兵 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

投稿信箱: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:天津环球磁卡股份有限公司

出版日期:2020年9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。

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)

2020年第8期(总第39卷第303期)

## 目次

### 特约专题

- 消防救援队伍防汛抗洪抢险救援工作探析 ..... 周详(1191)  
消防抗洪抢险救援的实践与思考 ..... 张道才(1192)  
九江抗洪抢险救援战术探究 ..... 马剑明、唐超、陈圣戈(1193)

### 消防理论研究

- 典型堆积可燃粉尘自燃特性实验研究 ..... 孟双、任常兴、张琰,等(1194)  
对位芳纶和阻燃粘胶纤维的热解及燃烧作用 ..... 朱方龙、李鑫、冯倩倩(1198)  
电动自行车充电保护系统设计研究 ..... 雷蕾、吕亚兵(1202)

### 建筑防火设计

- 钢管混凝土柱-组合梁单边螺栓连接框架耐火性能研究 ..... 项凯、曲怡鸣、潘雁昀,等(1206)  
轻质防护的装配式钢柱耐火性能试验研究 ..... 黄益良、彭磊、崔海浩(1211)  
高校体育馆人员疏散模拟研究 ..... 汪洋、朱国庆、周金炬,等(1215)

### 防灾减灾评估

- 考虑依赖心理因素的中观行人动力模型量化分析 ..... 谭笑、陈伟珂(1219)  
不同火源位置对地下管廊施工人员疏散影响研究 ..... 翟越、徐福顺、宗燕燕,等(1222)  
危险品停车场槽罐车泄漏风险分析及安全对策 ..... 曹宇、田宏(1227)  
城市隧道混凝土墙火灾行为数值模拟研究 ..... 刘扬(1232)  
海洋生态环境下海底管道泄漏耦合风险 ..... 张新生、何思宇(1236)

### 灭火系统设计

- 水喷雾雾化特性实验研究 ..... 郭鹏宇、王铭民、吴刘锁,等(1241)  
自动喷水灭火系统对地铁烟气特性的影响 ..... 代长青、袁慧(1245)  
智慧型自动喷水灭火系统软件的研发 ..... 张强、王皓轩、张磊,等(1249)  
船用细水雾灭火喷头结构优化与分析 ..... 王震、王杰、陈超,等(1253)

### 消防设备研究

- 多功能化学洗消消防车研制 ..... 张杰、周锋、李霖,等(1257)  
基于小波分析和Schwarz模型的串联电弧故障仿真研究 ..... 李伟祯、曲娜、张帅,等(1260)  
客船火灾烟气蔓延及火灾探测器响应试验研究 ..... 饶慧、肖曙明、梅秀娟,等(1264)  
灭火器的定位和有效性辨识研究 ..... 蒙慧玲(1267)

### 灭火剂与阻燃材料

- 抗溶型压缩空气泡沫灭火剂灭火试验研究 ..... 张宪忠、包志明、靖立帅,等(1271)  
双面格栅气凝胶隔热毡的研制及热防护性能 ..... 任洪雨、刘沙、陈维旺,等(1274)  
全氟己酮灭火剂热裂解产生氟化氢研究 ..... 陈培瑶、庄爽、刘琦,等(1277)

### 综合减灾与应急救援

- 2019年世界代表性国家和地区森林火灾发生概况分析 ..... 李伟克、殷继艳、郭赞权,等(1280)  
安宁市计划烧除点烧区域遴选研究 ..... 高仲亮、魏建珩、龙腾腾,等(1285)  
绳索救援中普鲁士抓结受力测试研究 ..... 张禹海(1290)  
消防指战员冬季体能训练有效性实证研究 ..... 吴翠翠、宋和胜、李小森(1294)  
绳索救助钢钎锚点承载力实验研究 ..... 赫中全(1297)

### 智慧消防与大数据应用

- 变电站消防机器人系统设计 ..... 张伟、阮鹏程、徐岳,等(1301)  
结构空间主动消防机器人系统研究与设计 ..... 刘永涛、孙瑞志、樊亚敏,等(1304)

### 应急管理研究

- 基层消防站如何开展作战能力评估 ..... 张景(1309)  
消防救援队伍应对新冠肺炎疫情的思考 ..... 罗军、周相羿(1312)

### 火灾调查研究

- 火场指纹显现技术研究进展 ..... 何明骏、金静、邓亮,等(1316)  
一起吸烟火灾事故的调查认定与分析 ..... 邓雨欣(1320)  
基于ISM的建筑火灾事故致因分析 ..... 刘欣、谢晨晨(1323)  
一起火灾事故的复核认定 ..... 刘颖、金楠(1327)

期刊基本参数:CN12-1311/TU \* 1982 \* b \* A4 \* 152 \* zh \* P \* ¥40.00 \* 9000 \* 39 \* 2020-08

# Fire Science and Technology

(monthly)

Founded in 1982

Vol.39, No.9, September 2020

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

**Sponsor:** Tianjin Fire Science and Technology 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:** Xiao Lei

**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, 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:** 2020-09-15

**Price:** ¥40.00

**Overseas Price:** \$ 15.00

## CONTENTS

### Contributing topic

- Analysis of flood prevention and rescue work of fire rescue force ..... ZHOU Xiang(1191)  
Practice and thinking of flood fighting and rescue work ..... ZHANG Dao-cai(1192)  
Research on flood fighting and rescue tactics of Jiujiang city ..... MA Jian-ming, TANG Chao, CHEN Sheng-ge(1193)

### Fire theory study

- Experimental study on the spontaneous combustion characteristics of typical accumulated combustible dust ..... MENG Shuang, REN Chang-xing, ZHANG Yan, *et al.*(1194)  
Pyrolysis and combustion of para aramid and flame retardant viscose fiber ..... ZHU Fang-long, LI Xin, FENG Qian-qian(1198)  
Design and research of charging protection system of electric bicycle ..... LEI lei, LV Ya-bing(1202)

### Building fire protection design

- Fire resistance of concrete-filled steel tubular column to composite beam frames with blind bolted connections ..... XIANG Kai, QU Yi-ming, PAN Yan-chong, *et al.*(1206)  
Experimental study on the fire resistance of assembled steel structure columns protected by light fireproof materials ..... HUANG Yi-liang, PENG Lei, CUI Hai-hao(1211)  
Simulation research on evacuation of university gymnasium ..... WANG Yang, ZHU Guo-qing, ZHOU Jin-ju, *et al.*(1215)

### Disaster prevention and mitigation assessment

- The quantitative analysis of mesoscopic pedestrian dynamic model considering conformity ..... TAN Xiao, CHEN Wei-ke(1219)  
Study on the influence of different fire sources on the evacuation of underground utility tunnel ..... ZHAI Yue, XU Fu-shun, ZONG Yan-yan, *et al.*(1222)  
Leakage risk analysis and safety countermeasures of tank truck in vehicle parking lot for dangerous goods ..... CAO Yu, TIAN Hong(1227)  
Numerical simulation on fire behavior of concrete wall in urban tunnel ..... LIU Yang(1232)  
Coupling risk of submarine pipeline leakage in marine ecological environment ..... ZHANG Xin-sheng, HE Si-yu(1236)

### Design of fire extinguishing system

- Experimental study on the atomization characteristics of fire spray ..... GUO Peng-yu, WANG Ming-min, WU Liu-suo, *et al.*(1241)  
Influence of automatic sprinkler system on the smoke characteristics of subway fire ..... DAI Chang-qing, YUAN Hui(1245)  
Smart automatic sprinkler system software development ..... ZHANG Qiang, WANG Hao-xuan, ZHANG Lei, *et al.*(1249)  
Structure optimization and analysis of marine water mist fire extinguishing nozzle ..... WANG Zhen, WANG Jie, CHEN Chao, *et al.*(1253)

### Study of fire equipment

- Development of multi-functional chemical decontamination fire truck ..... ZHANG Jie, ZHOU Feng, LI Lin, *et al.*(1257)  
Research on arc fault simulation based on Schwarz model and wavelet analysis ..... LI Wei-zhen, QU Na, ZHANG Shuai, *et al.*(1260)  
Experimental study on smoke spreading law and fire detector response time of a passenger ship fire ..... RAO Hui, XIAO Shu-ming, MEI Xiu-juan, *et al.*(1264)  
Research on location and effectiveness identification of fire extinguishing facilities ..... MENG Hui-ling(1267)

### Fire agent and flame retardant material

- Experimental study on fire extinguishing with alcohol-resistant compressed air foam ..... ZHANG Xian-zhong, BAO Zhi-ming, JING Li-shuai, *et al.*(1271)  
Development of double-sided grille aerogel thermal insulation felt and study on its thermal protective properties ..... REN Hong-yu, LIU Sha, CHEN Wei-wang, *et al.*(1274)  
Study on the generation of hydrogen fluoride by thermal decomposition of C6F-ketone extinguishing agent ..... CHEN Pei-yao, ZHUANG Shuang, LIU Qi, *et al.*(1277)

### Comprehensive disaster reduction and emergency rescue

- Analysis of forest fires in representative countries and regions in the world in 2019 ..... LI Wei-ke, YIN Ji-yan, GUO Zan-quan, *et al.*(1280)  
Study on reconnaissance of prescribed burning in Anning City ..... GAO Zhong-liang, WEI Jian-heng, LONG Teng-teng, *et al.*(1285)  
Experimental research on Prusik knot force in rope rescue ..... ZHANG Yu-hai(1290)  
An empirical study on effectiveness of winter physical fitness training of fire officers ..... WU Cui-cui, SONG He-sheng, LI Xiao-sen(1294)  
Experimental study on bearing capacity of anchor point with steel drill rod for rope rescue ..... HE Zhong-quan(1297)

### Intelligent fire protection and big data application

- Design of a fire-fighting robot system for transformer substation ..... ZHANG Wei, RUAN Peng-cheng, XU Yue, *et al.*(1301)  
Research and design of structural space active firefighting robot system ..... LIU Yong-tao, SUN Rui-zhi, FAN Ya-min, *et al.*(1304)

### Emergency management study

- How to carry out combat capability evaluation in fire station ..... ZHANG JING(1309)  
Thinking of fire rescue force's response to 2019-nCoV pneumonia ..... LUO Jun, ZHOU Xu-yi(1312)

### Fire investigation and analysis

- Research progress of fingerprint recovery technology at fire scene ..... HE Ming-jun, JIN Jing, DENG Liang, *et al.*(1316)  
Identification and analysis of a smoking fire accident ..... DENG Yu-xin(1320)  
Analysis of the casualty causes of building fire accidents based on ISM model ..... LIU Xin, XIE Chen-chen(1323)  
The identification of a fire accident review ..... LIU Ying, JIN Nan(1327)