

CHINA MEASUREMENT & TEST

中国测试

ZHONGGUO CESHU

ISSN 1674-5124
CN 51-1714/TB

10

October

2019

第45卷 总第255期

2019年10月



中文核心期刊

中国科技核心期刊

中国科技论文统计源期刊

中国学术期刊综合评价数据库全文收录期刊

中国期刊（光盘版）全文收录期刊

《万方数据——数字化期刊群》全文收录期刊

RCCSE中国核心学术期刊（A）

美国《化学文摘》（CA）收录期刊

美国《剑桥科学文摘（工程技术）》（CSA）收录期刊

美国《剑桥科学文摘（自然科学）》（CSA）收录期刊

俄罗斯《文摘杂志》收录期刊

美国《乌利希期刊指南》收录期刊

万方数据

主管：中国测试技术研究院



目次

测试理论

- | | | |
|---------------------------|-----------------|----|
| 基于 CNN 与多通道声学信号的齿轮故障诊断 | 李少波, 姚勇, 桂桂, 等 | 1 |
| 线结构光视觉传感器机器人手眼关系标定 | 陆艺, 沈添秀, 郭小娟, 等 | 6 |
| 基于改进经验小波变换的滚动轴承故障特征提取方法研究 | 刘自然, 胡毅伟, 石璞, 等 | 10 |
| 合格判定在时间频率计量校准领域应用研究 | 安平, 曾亮 | 16 |

测试方法

物理测试

- | | | |
|--------------------------|------------------|----|
| 基于改进双向双边测距的超宽带定位技术及应用研究 | 李小亭, 郎月新, 韦子辉, 等 | 21 |
| 光纤光栅肘关节角度测量方法 | 马晓源, 路长厚, 李学勇, 等 | 28 |
| 基于自适应滤波的薄层厚度超声测量方法 | 黄巧盛, 周世圆, 张翰明, 等 | 34 |
| 超声纵横波螺栓载荷在线检测方法研究 | 李栋, 朱晓磊, 陆晓峰 | 40 |
| INS 辅助 PLL 载波相位跟踪环路高动态测试 | 班亚龙 | 45 |

化学与生物测试

- | | | |
|-------------------------------------|------------------|----|
| 烟碱-苹果酸盐制备及晶体结构理论分析 | 李志强, 黄江华, 雷萍, 等 | 53 |
| ICP-AES 法测定铬酸盐体系半无机涂层液中磷、铝、铁、镁、锌的含量 | 董礼男, 朱春要, 周强, 等 | 62 |
| 微波消解-电感耦合等离子体发射光谱法测定松茸中 9 种金属元素 | 李常雄, 邹海民, 杨晓松, 等 | 66 |
| 植物乳杆菌对牦牛肌肉蛋白提取物的降解能力研究 | 刘保, 丁捷, 白婷, 等 | 71 |

测试仪器

- | | | |
|------------------------|-----------------|-----|
| 涡轮流量传感器油耗测量及流阻特性实验分析 | 尹川, 李晓琳, 郭政波 | 78 |
| 基于弹载测控系统的便捷无线交互设计 | 高诗尧, 李杰, 胡陈君, 等 | 84 |
| 一种补偿法液位计检定装置的设计与不确定度分析 | 甘蓉, 郝罗亮, 王歆鑫, 等 | 90 |
| 高低温环境圆光栅角度编码器校准装置精度设计 | 张宝玉, 杨天豪, 朱跃, 等 | 96 |
| 四点简支等弯矩梁装置对应变计标定精度影响 | 晏志鹏, 邓足斌 | 101 |

测控技术

- | | | |
|-----------------------------|------------------|-----|
| 高速列车脱轨监测关键算法研究 | 艾永军, 陈春俊, 熊仕勇, 等 | 109 |
| 基于风电场 SCADA 系统的云平台设计 | 梁涛, 李燕超, 许琰, 等 | 114 |
| 基于 CNN 和声音时频特征图的微型振动马达故障判别 | 冯涛, 王杰, 方夏, 等 | 120 |
| Petri 网智能变电站保护控制故障诊断与定位方法研究 | 陈军, 刘鑫, 王利平, 等 | 128 |
| 基于 SVDD 的煤化工无人值守设备预警平台研制 | 杨健健, 王超, 杨伟伟, 等 | 135 |

性能测试

- | | | |
|----------------------------|-----------------|-----|
| 偏置磁场强度对交叉线圈式扭转导波换能器换能效率的影响 | 刘志伟, 徐江, 陈广 | 139 |
| EtherCAT 应用于机载测试系统构建可行性研究 | 黄敏, 马飞扬, 刘广哲, 等 | 145 |
| 低合金钢板背面腐蚀坑的超声波反射特性 | 殷尊, 金敏华, 张红军, 等 | 153 |
| 锚泊安全视域下的锚链振动特征检测实验研究 | 王涌, 韩东, 苑志江, 等 | 159 |
| 吊具夹持机构的结构优化研究 | 代春香, 孟令宽, 李三雁 | 164 |

CONTENTS

Test Theories

Gear fault diagnosis based on CNN and multi-channel acoustic signals	<i>LI Shaobo, YAO Yong, GUI Gui, et al</i>	1
Robot hand-eye relationship calibration based on line structured light vision sensor	<i>LU Yi, SHEN Tianxiu, GUO Xiaojuan, et al</i>	6
Fault feature extraction method of rolling bearing based on enhanced empirical wavelet transform	<i>LIU Ziran, HU Yuwei, SHI Pu, et al</i>	10
Research on the application of qualification decision in calibration of time and frequency	<i>AN Ping, ZENG Liang</i>	16

Test Methods

Physics

Research on UWB location technology and application based on improved symmetric double sided two-way ranging	<i>LI Xiaoting, LANG Yuexin, WEI Zihui, et al</i>	21
Measuring method of elbow joint angle based on fiber Bragg grating	<i>MA Xiaoyuan, LU Changhou, LI Xueyong, et al</i>	28
Ultrasonic measurement method for thin layer thickness based on adaptive filtering	<i>HUANG Qiaosheng, ZHOU Shiyuan, ZHANG Hanming, et al</i>	34
On line detection method of bolt load based on ultrasonic longitudinal and transverse waves	<i>LI Dong, ZHU Xiaolei, LU Xiaofeng</i>	40
Tests and analysis of PLL with INS aiding under high dynamics	<i>BAN Yalong</i>	45

Chemistry and Biology

Preparation and crystal structure theoretical analysis of nicotine-malate	<i>LI Zhiqiang, HUANG Jianghua, LEI Ping, et al</i>	53
Determination of phosphorus, aluminum, iron, magnesium and zinc in semi-inorganic coating solution of chromate system by ICP-AES	<i>DONG Li'nan, ZHU Chunyao, ZHOU Qiang, et al</i>	62
Determination of nine metallic elements in tricholoma matsutake by microwave digestion-inductively coupled plasma atomic emission spectrometry	<i>LI Changxiong, ZOU Haimin, YANG Xiaosong, et al</i>	66
Degradation of yak muscle protein extracts by <i>Lactobacillus plantarum</i>	<i>LIU Bao, DING Jie, BAI Ting, et al</i>	71

Test Instruments

Fuel consumption measurement and flow resistance characteristics experimental analysis of turbine flow sensor	<i>YIN Chuan, LI Xiaolin, GUO Zhengbo</i>	78
Design of convenient wireless interaction based on missile borne measurement and control system	<i>GAO Shiyao, LI Jie, HU Chenjun, et al</i>	84
Design and uncertainty analysis of a compensation method verification device of liquid level meter	<i>GAN Rong, HAO LuoLiang, WANG Xinxin, et al</i>	90
Accuracy design of circular grating angle encoder calibration device for high and low temperature environment	<i>ZHANG Baoyu, YANG Tianhao, ZHU Yue, et al</i>	96
Influence of strain gages calibration accuracy with four-point simple supported curved beam device	<i>YAN Zhipeng, DENG Zubin</i>	101

Measurement and Control Technologies

Research on key algorithms for derailment monitoring of high speed trains	<i>AI Yongjun, CHEN Chunjun, XIONG Shiyong, et al</i>	109
Design of cloud platform based on wind farm SCADA system	<i>LIANG Tao, LI Yanchao, XU Yan, et al</i>	114
Fault diagnosis method for micro-vibration motor based on CNN and time-frequency characteristic map of sound	<i>FENG Tao, WANG Jie, FANG Xia, et al</i>	120
Research on fault diagnosis and location method in smart substation protection and control based on Petri net	<i>CHEN Jun, LIU Xin, WANG Liping, et al</i>	128
Development of an early warning platform for unattended equipment in coal chemical industry based on SVDD	<i>YANG Jianjian, WANG Chao, YANG Weiwei, et al</i>	135

Performance Tests

Effect of bias magnetic field strength on coupling efficiency of cross-coil torsional guided wave transducer	<i>LIU Zhiwei, XU Jiang, CHEN Guang</i>	139
Research of the feasibility of EtherCAT in the airborne test system	<i>HUANG Min, MA Feiyang, LIU Guangzhe, et al</i>	145
Ultrasonic reflection characteristics of corrosion pits on back side of low alloy steel plate	<i>YIN Zun, JIN Minhua, ZHANG Hongjun, et al</i>	153
Experiment study on vibration characteristics of anchor chain from the perspective of anchorage safety	<i>WANG Yong, HAN Dong, YUAN Zhijiang, et al</i>	159
Research on structural optimization of spreader clamping mechanism	<i>DAI Chunxiang, MENG Lingkuan, LI Sanyan</i>	164