

ISSN 0258 - 8013

CODEN ZDGXER

中国电机工程学报

第四十二卷 第二十四期 2022年12月

中国电机工程学报

半月刊

第 42 卷 第 24 期

Proceedings of the CSEE

SEMIMONTHLY

Vol.42 No.24



12月
2022
2022-12-20 出版

ISSN 0258-8013



9 770258 801223



中国电机工程学会主办
THE CHINESE SOCIETY FOR ELECTRICAL ENGINEERING



中国电机工程学报

ZHONGGUO DIANJI GONGCHENG XUEBAO

第 42 卷

第 24 期 卷终（总第 707 期）

2022 年 12 月 20 日

目 次

（论文电子版 <http://www.pcsee.org/CN/column/home.shtml>）

· 智能电网 ·

- 柔性互联下的 MMC-HVDC 模块化建模和次同步振荡的信息时滞诱因探究 曹靖洺, 董朝宇, 穆云飞, 余晓丹, 肖迁, 贾宏杰 (8803)
综合能源天然气网混氢输运的仿真与调度综述 严思韵, 周登极 (8816)
净零能耗驱动的楼宇群能源共享对等聚合模型 蔡文辉, 高红均, 李海波, 张洪财, 刘景荣, 张江林 (8832)
计及用户不确定性的多时段耦合需求响应激励优化策略 张全明, 崔晓昱, 张笑弟, 孙毅 (8844)
基于预测信息二维坐标动态划分的风电集群功率超短期预测 杨茂, 彭天, 苏欣 (8854)
基于行波全波形主频分量衰减特性的高压输电线路快速保护方法 邓丰, 黄懿菲, 祖亚瑞, 曾哲, 曾祥君 (8864)
基于香农熵加权投票算法的集成式非侵入式负荷识别方法 魏广芬, 赵航, 胡春华, 刘骞 (8876)

· 智能配用电 ·

- 融入多源量测数据的配电网分布式区间状态估计 徐俊俊, 吴在军, 张鹏飞, 茅明明, 胡秦然 (8888)
10kV 配电线路感应雷过电压波形特征实测分析 杨庆, 张新东, 孙健, 徐文华, 和文龙, 王科, 秦忠 (8900)
具备接地故障电流转移功能的配电网柔性多状态开关设计方法研究 张彬隆, 郭谋发, 简玉婕 (8910)
基于分数阶电容的多个低次电流谐波抑制方法 林智乐, 张靖雨, 何良宗 (8921)

· 发电 ·

- 超临界 CO₂两级离心式压缩机实验研究 朱玉铭, 梁世强, 郭永献, 郭朝红, 龚新宇, 姜玉雁 (8933)
基于改进自私羊群算法的光伏红外热图像热斑识别方法 孙海蓉, 周映杰, 张镇韬, 赵振凯 (8942)
燃煤锅炉屏式过热器壁温耦合计算方法 金东昊, 刘欣, 张效源, 沈迎, 王涛, 李驰, 李新颖, 魏佳, 付静, 王赫阳 (8951)

- 炉排固相和炉膛气相燃烧耦合的 MSWI 过程模拟 庄家宾, 汤健, 夏恒, 乔俊飞 (8961)

· 电力电子与电力传动 ·

- 多中压交流端口链式电池储能功率变换系统 张建文, 孙人成, 周剑桥, 施刚, 杨兴武, 蔡旭 (8972)
一种基于 PCB 平面螺旋线圈的自补偿多中继无线电能传输系统设计 管乐诗, 肖扬雲, 王懿杰, 姚婷婷, 徐殿国 (8984)
具有低开关频率特性的指定谐波抑制预测控制方法研究 齐昕, 杨康, 王辰宇, 苏涛, 周珂, 甘新鹏, 徐德明 (8995)
空间全向无线电能传输技术研究与应用综述 郭海潮, 张献, 杨庆新, 沙琳, 王奉献, 朱子旭 (9006)
高频谐振变换器多目标优化参数设计方法研究 顾玲, 樊赫, 李磊 (9022)

· 电机与电器 ·

- 基于间接二次谐波注入的三级式同步电机低速阶段无位置传感器起动控制 王俊杰, 魏佳丹, 郁钧豪, 周波 (9031)
新型双层串联混合永磁记忆电机设计优化与特性分析 阳辉, 王逸贤, 郑昊, 吕舒康, 林鹤云 (9042)
采用多标量模型的感应电机简化模型预测转矩控制算法 王静, 卢子广 (9053)
基于比例谐振型自抗扰控制的永磁同步电机电流解耦及谐波抑制策略研究 陈哲, 张序轩, 刘春强, 张航, 骆光照 (9062)

- 基于负载磁场考虑涡流反作用的带护套高速永磁电机转子涡流损耗解析模型 佟文明, 侯明君, 鹿吉文, 吴胜男, 贾建国 (9072)

- 基于三矢量模型的漏磁可控永磁电机最小铜耗控制 范文杰, 全力, 徐磊, 朱孝勇, 陈强 (9084)

· 电工理论与新技术 ·

- 基于特征频率阻抗的锂离子电池健康状态评估 董明, 范文杰, 刘王泽宇, 张志斌, 任明 (9094)
用于压接型 IGBT 器件芯片电流测量的带金属屏蔽层集成 PCB Rogowski 线圈的研究 焦超群, 黄涛, 张秀敏, 代安琪 (9105)

- 基于降维处理的 Tikhonov 正则化 ECT 图像重建 王艳, 颜华, 王伊凡, 周英钢 (9118)

· 高电压技术 ·

- 极化效应作用下长方体各向同性电光晶体中光束相移的解析计算 樊星, 陈维江, 张乔根, 赵军, 裴哲浩 (9126)
不同粒径 Al₂O₃ 颗粒掺杂的环氧树脂复合材料直流电树特性 朱光宇, 陈向荣, 洪泽林, 江铁, 戴超, 孟繁博 (9136)
C₄F₇N 混合气体在 40.5kV 断路器中的应用研究(二): 灭弧性能实验与弧后分解特性 张博雅, 周然, 郝迈, 杨韬, 李兴文, 姜旭, 朱凯, 邓云坤 (9147)

· 行业信息 ·

- 《中国电机工程学报》再创佳绩 (9135)

- 《中国电机工程学报》2022 年度全年总目录 (9159)

· 英文概述见论文电子版 ·

**PROCEEDINGS OF THE CHINESE SOCIETY FOR
ELECTRICAL ENGINEERING**
(PROCEEDINGS OF THE CSEE)

Vol.42 No.24 EOV (Ser. 707)

Dec. 20, 2022

CONTENTS

(Electronic Journals <http://www.pcsee.org/EN/column/current.shtml>)

• Smart Grid •

- Modular Modeling of the Flexibly Interconnected MMC-HVDC System and the Study on the Cyber Delay Inducement of Subsynchronous Oscillation CAO Jingming, DONG Chaoyu, MU Yunfei, YU Xiaodan, XIAO Qian, JIA Hongjie (8803)
Review of Simulation and Scheduling of Hydrogen-blended Transportation in Natural Gas Network of Integrated Energy System YAN Siyun, ZHOU Dengji (8816)
Net Zero Energy Driven Power Sharing for Aggregated Buildings: A Peer Aggregation Model CAI Wenhui, GAO Hongjun, LI Haibo, ZHANG Hongcai, LIU Jingrong, ZHANG Jianglin (8832)
Incentive Optimization Strategy of Multi Period Coupling Demand Response Considering User Uncertainty ZHANG Quanming, CUI Xiaoyu, ZHANG Xiaodi, SUN Yi (8844)
Ultra-short Term Wind Power Prediction Based on Two-dimensional Coordinate Dynamic Division of Prediction Information YANG Mao, PENG Tian, SU Xin (8854)
High-speed Protection Method for Transmission Line Based on the Dominant Frequency Component Attenuation Characteristics of Traveling-wave Full Waveform DENG Feng, HUANG Yifei, ZU Yarui, ZENG Zhe, ZENG Xiangjun (8864)
An Ensemble Non-intrusive Load Identification Method Based on Shannon Entropy Weighted Voting Algorithm WEI Guangfen, ZHAO Hang, HU Chunhua, LIU Qian (8876)

• Smart Electric Power Distribution and Utilization Technologies •

- A Distributed Interval State Estimation Framework of Distribution Networks Based on Multi-source Measurements XU Junjun, WU Zaijun, ZHANG Tengfei, MAO Mingming, HU Qinran (8888)
Waveform Analysis on Characteristics of Lightning Induced Overvoltages on 10kV Overhead Distribution Lines YANG Qing, ZHANG Xindong, SUN Jian, XU Wenhua, HE Wenlong, WANG Ke, QIN Zhong (8900)
Research on Design Method of Flexible Multi-state Switch With Ground Fault Current Transfer Function for Distribution Networks ZHANG Binlong, GUO Moufa, JIAN Yujie (8910)
Method of Multiple Low-order Harmonic Currents Suppression Based on Fractional-order Capacitor LIN Zhile, ZHANG Jingyu, HE Liangzong (8921)

• Power Generation •

- Experimental Study on Supercritical CO₂ Two-stage Centrifugal Compressor ZHU Yuming, LIANG Shiqiang, GUO Yongxian, GUO Chaohong, GONG Xinyu, JIANG Yuyan (8933)
Hot Spot Recognition Method of Photovoltaic Infrared Thermal Image Based on Improved Selfish Herd Algorithm SUN Hairong, ZHOU Yingjie, ZHANG Zhenqiao, ZHAO Zhenkai (8942)
A Coupled Model for Predicting the Tube Temperature of Platen Superheater of Coal-fired Boiler JIN Donghao, LIU Xin, ZHANG Xiaoyuan, SHEN Ying, WANG Tao, LI Chi, LI Xinxing, WEI Jia, FU Jing, WANG Heyang (8951)
MSWI Process Simulation Based on Coupling Combustion of Solid Phase on Grate and Gas Phase in Furnace ZHUANG Jiabin, TANG Jian, XIA Heng, QIAO Junfei (8961)

• Power Electronics and Drives •

- A Novel Energy Storage Power Conversion System Based on Multiple Medium Voltage AC-ports Cascaded H-bridge Converter ZHANG Jianwen, SUN Rencheng, ZHOU Jianqiao, SHI Gang, YANG Xingwu, CAI Xu (8972)
Design of a Self-compensating Multi-relay Wireless Power Transmission System Based on PCB Planar Spiral Coil GUAN Yueshi, XIAO Yangyun, WANG Yijie, YAO Tingting, XU Dianguo (8984)
Predictive Control of Specified Harmonic Suppression Switching Strategies With Low Switching Frequency Characteristics QI Xin, YANG Kang, WANG Chenu, SU Tao, ZHOU Ke, GAN Xinpeng, XU Deming (8995)
Review of Research and Application of Spatial Omnidirectional Wireless Power Transmission Technology GUO Haichao, ZHANG Xian, YANG Qingxin, SHA Lin, WANG Fengxian, ZHU Zixu (9006)
Multi-objective-optimized Parameter Design Method for High-frequency Resonant Converter GU Ling, FAN He, LI Lei (9022)

• Electric Machines and Apparatus •

- Sensorless Starting Control of Three-stage Synchronous Machines at Low Speed Based on Indirectly Injected Second Harmonic Signals WANG Junjie, WEI Jiadan, YU Junhao, ZHOU Bo (9031)
Design Optimization and Characteristics Analysis of a Novel Dual-layer Series Hybrid Permanent Magnet Memory Machine YANG Hui, WANG Yixian, ZHENG Hao, LYU Shukang, LIN Heyun (9042)
Simplified Model Predictive Torque Control Algorithm of Induction Motor Using Multiscalar Model WANG Jing, LU Ziguang (9053)
Research on Current Decoupling and Harmonic Suppression Strategy of Permanent Magnet Synchronous Motor Based on Proportional Resonance Type ADRC CHEN Zhe, ZHANG Xuxuan, LIU Chunqiang, ZHANG Hang, LUO Guangzhao (9062)
Rotor Eddy Current Loss Analytical Model for High-speed Permanent Magnet Motor With Sleeve Based on Loaded Magnetic Field Analysis Considering Eddy Current Reaction Effect TONG Wenming, HOU Mingjun, LU Jiwen, WU Shengnan, JIA Jianguo (9072)
Minimum Copper Loss Control of the Controllable Leakage Flux PM Motor Based on the Three Vector Model FAN Wenjie, QUAN Li, XU Lei, ZHU Xiaoyong, CHEN Qiang (9084)

• Theory and New Technology of Electrical Engineering •

- Health Assessment of Lithium-ion Batteries Based on Characteristic Frequency Impedance DONG Ming, FAN Wenjie, LIU Wangzeyu, ZHANG Zhibin, REN Ming (9094)
Integrated Rogowski Coil Sensor for Press-pack Insulated Gate Bipolar Transistor Chips With Shielding Layers JIAO Chaoqun, HUANG Tao, ZHANG Xiumin, DAI Anqi (9105)
ECT Image Reconstruction Based on Dimension-reduction Tikhonov Regularization WANG Yan, YAN Hua, WANG Yifan, ZHOU Yinggang (9118)

• High Voltage Engineering •

- Analytical Calculation of Beam Phase-shift in Cuboid Isotropic Electro-optic Crystal With Polarization Effect FAN Xing, CHEN Weijiang, ZHANG Qiaogen, ZHAO Jun, PEI Zhehao (9126)
DC Electrical Treeing Characteristics for the Epoxy Resin Composites Doped With Different Al₂O₃ Particle Sizes ZHOU Guangyu, CHEN Xiangrong, HONG Zelin, JIANG Tie, DAI Chao, MENG Fanbo (9136)
Research on the Application of C₄F₇N Gas Mixture in a 40.5kV Circuit Breaker (Part II): Arc Extinguishing Performance Tests and Decomposition Property ZHANG Boya, ZHOU Ran, HAO Mai, YANG Tao, LI Xingwen, JIANG Xu, ZHU Kai, DENG Yunkun (9147)

• For Extended Summaries, Please See the Electronic Journals •