

目次 CONTENTS

专题——高温腐蚀与防护

Special Topic—High Temperature Corrosion and Protection

1 等离子-物理气相沉积 (PS-PVD) 及其射流非接触检测方法

Plasma Spray-physical Vapor Deposition (PS-PVD) and Non-contact Detection Method of Plasma Jet

刘梅军, 李广荣, 杨冠军, 李长久

LIU Mei-jun, LI Guang-rong, YANG Guan-jun, LI Chang-jiu

17 氧化铝形成合金中活性元素效应的研究进展

Research Progress of Reactive Element Effect in Alumina-forming Alloys

曹雪珍, 何健, 郭洪波

CAO Xue-zhen, HE Jian, GUO Hong-bo

25 自修复金属搪瓷高温防护涂层

Self-healing High-temperature Protective Metal-Enamel Composite Coatings

廖依敏, 陈明辉, 王福会, 朱圣龙

LIAO Yi-min, CHEN Ming-hui, WANG Fu-hui, ZHU Sheng-long

35 粘结层真空退火处理对热障涂层热循环寿命的影响研究

Influence of Bond-coat Vacuum-annealing on the Lifetime of EB-PVD TBCs

刘贺, 李帅, 余春堂, 蒋成洋, 鲍泽斌, 朱圣龙, 王福会

LIU He, LI Shuai, YU Chun-tang, JIANG Cheng-yang,

BAO Ze-bin, ZHU Sheng-long, WANG Fu-hui

41 激光表面改性对熔盐环境下热障涂层相稳定性和微观结构的影响

Effects of Laser Surface Modification on Phase Stability and Microstructures of Thermal Barrier Coatings in V_2O_5 Molten Salt

郭磊, 辛会, 张馨木, 叶福兴, 高远

GUO Lei, XIN Hui, ZHANG Xin-mu, YE Fu-xing, GAO Yuan

49 四种典型高温防护涂层的抗氧化性能

Isothermal Oxidation of Four Typical High-temperature Protective Coatings

阳颖飞, 任盼, 鲍泽斌, 朱圣龙, 王福会, 李卫

YANG Ying-fei, REN Pan, BAO Ze-bin, ZHU Sheng-long, WANG Fu-hui, LI Wei

56 利用 SiO_2 中间层提高铝化物涂层的高温防护性能

Improvement of the High-temperature Oxidation Resistance of Aluminide Coating by SiO_2 Interlayer

吴景佳, 蒋梅燕, 刘敏, 周宇通, 蔡逸缘, 伍廉奎

WU Jing-jia, JIANG Mei-yan, LIU Min, ZHOU Yu-tong, CAI Yi-yuan, WU Lian-kui

64 Super304H 钢表面铝扩散涂层的组织结构和抗蒸汽氧化性能

Microstructure and Steam Oxidation Performance of the Aluminium Diffusion Coating on Super304H Steel

杨珍, 鲁金涛, 张鹏, 周永莉, 黄锦阳, 党莹樱, 袁勇, 谷月峰

YANG Zhen, LU Jin-tao, ZHANG Peng, ZHOU Yong-li,

HUANG Jin-yang, DANG Ying-ying, YUAN Yong, GU Yue-feng

72 磁控溅射法制备 FeCrAlY 薄膜表征及其在高温水环境中的抗腐蚀性能研究

Characterization of FeCrAlY Thin Film Deposited by Magnetron Sputtering and Its Corrosion Resistance under High-temperature Water Vapor Environment

崔勇, 李长记, 李静, 熊良银, 刘实

CUI Yong, LI Chang-ji, LI Jing, XIONG Liang-yin, LIU Shi

79 铝合金表面氧化层在燃烧气氛中的退化行为

Degradation of Oxide on Surface of Al-Mg Alloy in Combustion Atmospheres

谢冬柏, 洪昊, 多树旺, 王文

XIE Dong-bai, HONG Hao, DUO Shu-wang, WANG Wen

87 煤油助燃剂燃烧气氛对低碳钢表面氧化层的影响

Effect of Kerosene Combustion Atmosphere on Surface Oxide Layer of Low-carbon Steel

洪昊, 谢冬柏, 多树旺

HONG Hao, XIE Dong-bai, DUO Shu-wang

研究综述 Review

94 面心立方金属材料压入初期突变现象的位错机制

Dislocation Mechanism of Discontinuous Phenomenon in Incipient Stage of Face-centered Cubic Metal Indentation

汪可华, 宋宝睿, 涂文静, 李雁准, 王福德, 陈坚

WANG Ke-hua, SONG Bao-rui, TU Wen-jing, LI Yan-huai, WANG Fu-de, CHEN Jian

103 石墨和 C/C 复合材料表面 ZrB₂-SiC 陶瓷涂层的研究进展

Research Progress of ZrB₂-SiC Ceramic Coating on Graphite and C/C Composites

王凯凯, 李争显, 汪欣, 李伟, 相远帆

WANG Kai-kai, LI Zheng-xian, WANG Xin, LI Wei, XIANG Yuan-fan

113 铝合金表面沉积类金刚石薄膜的研究进展

Research Progress in Diamond-like Carbon Films Deposited on Aluminum Alloy

周佳, 孙丽丽, 郭鹏, 左潇, 柯培玲, 程晓英, 汪爱英

ZHOU Jia, SUN Li-li, GUO Peng, ZUO Xiao, KE Pei-ling, CHEN Xiao-ying, WANG Ai-ying

122 等离子喷涂金属/陶瓷梯度热障涂层研究进展

Research Progress of Metal/Ceramic Gradient Thermal Barrier Coatings by Plasma Spraying

周雳, 邢志国, 王海斗, 黄艳斐, 郭伟玲, 米庆博

ZHOU Li, XING Zhi-guo, WANG Hai-dou, HUANG Yan-fei, GUO Wei-ling, MI Qing-bo

132 壳聚糖及其衍生物在金属缓蚀剂方面的研究应用综述

The Research and Application of Chitosan and Its Derivatives in Metal Corrosion Inhibitors are Reviewed

刘诗桃, 廖柯熹, 何国玺, 曾余祥, 葛清晓, 周飞龙, 吕茜娣, 赵帅

LIU Shi-tao, LIAO Ke-xi, HE Guo-xi, ZENG Yu-xiang,

GE Qing-xiao, ZHOU Fei-long, LYU Xi-di, ZHAO Shuai

142 三元层状固体润滑 Ti₃SiC₂ 复合材料的制备与摩擦学研究进展

Preparation and Tribological Research Progress of Ternary Layered Solid Lubricating Material Ti₃SiC₂ and Its Composites

汪阳, 刘秀波, 欧阳春生, 罗迎社, 陈德强

WANG Yang, LIU Xiu-bo, OUYANG Chunsheng, LUO Ying-she, CHEN De-qiang

154 石墨烯在涂镀层防腐领域的应用研究及进展

Application and Development of Graphene in the Field of Coating-plating Corrosion Protection

李泽民, 王胜民, 赵晓军, 张俊, 潘艳芝

LI Ze-min, WANG Sheng-min, ZHAO Xiao-jun, ZHANG Jun, PAN Yan-zhi

163 燃气轮机在海洋环境下的热腐蚀与防护技术研究进展

Research Progress of Hot Corrosion and Protection Technology of Gas Turbine under Marine Environment

杨宏波, 王源升, 王轩, 武强

YANG Hong-bo, WANG Yuan-sheng, WANG Xuan, WU Qiang

表面功能化 Surface Functionalization

173 电沉积工艺参数对镍-钼-锌三元合金电极析氢催化性能的影响

Effect of Electrodeposition Process Parameters on Catalytic Performance of Ni-Mo-Zn Ternary Alloy Electrode for Hydrogen Evolution

彭文屹, 朱峰, 邓晓华, 陶钧, 周颖钰

PENG Wen-yi, ZHU Feng, DENG Xiao-hua, TAO Jun, ZHOU Ying-yu

180 尼龙 66 复合镀电磁屏蔽织物

Electromagnetic Shielding Fabric of Nylon 66 Composite Plating

熊林利, 黎学明, 王涛, 徐珂

XIONG Lin-li, LI Xue-ming, WANG Tao, XU Ke

表面摩擦磨损与润滑 Surface Friction Wear and Lubrication

187 横向应力场对原子尺度摩擦的调制

Modulation of Transverse Stress Field on Atomic-scale Friction

郭一伯, 庞华, 刘大猛

GUO Yi-bo, PANG Hua, LIU Da-meng

194 304 不锈钢在人工海水环境中的腐蚀磨损行为研究

Tribocorrosion Behaviors of 304 Stainless Steel in Artificial Seawater

曾群锋, 许雅婷, 林乃明

ZENG Qun-feng, XU Ya-ting, LIN Nai-ming

203 直接激光沉积 Al_2O_3 增强 NiCrAlY 涂层的微观组织及力学性能

Microstructure and Mechanical Properties of Al_2O_3 Reinforced NiCrAlY Coatings by Directed Laser Deposition

吴东江, 刘妮, 余超, 崔强, 牛方勇, 马广义, 赵凯

WU Dong-jiang, LIU Ni, YU Chao, CUI Qiang, NIU Fang-yong, MA Guang-yi, ZHAO Kai

213 Mg 元素对强流脉冲电子束改性后 Al-20Si 合金表面微观组织及性能的影响

Effects of Mg on Surface Microstructure and Mechanical Properties of HCPEB Treated Al-20Si Alloy

李魁, 高波, 徐宁, 任娅维, 邢鹏飞

LI Kui, GAO Bo, XU Ning, REN Ya-wei, XING Peng-fei

221 SLM 成形 316L 工艺对滑动磨损特性及硬度的影响

Effect of 316L SLM Forming Process on Sliding Wear Characteristics and Hardness

黄明吉, 杨颖超, 冯少川

HUANG Ming-ji, YANG Ying-chao, FENG Shao-chuan

228 偏压对 MPP 制备 AlTiSiN 纳米复合涂层结构及性能的影响

Influence of Bias Voltage on Microstructure and Properties of AlTiSiN Nanocomposite Coatings Prepared by MPP

贵宾华, 周晖, 郑军, 马占吉, 杨拉毛草, 张延帅

GUI Bin-hua, ZHOU Hui, ZHENG Jun, MA Zhan-ji, YANG La-mao-cao, ZHANG Yan-shuai

表面失效及防护 Surface Failure and Protection

237 考虑多腐蚀缺陷作用效应的海底管道失效压力分析

Failure Pressure Assessment of Submarine Pipelines Considering the Effects of Multiple Corrosion Defects Interaction

秦鹏程, 熊春宝, 李志, 翟京生

QIN Peng-cheng, XIONG Chun-bao, LI Zhi, ZHAI Jing-sheng

245 轨腰仿生自分层防腐梯度涂料合成及影响因素和结构探究

Synthesis, Influencing Factors and Structure of Bionic Self-layering Anti-corrosion Gradient Coating for Rail Waist

郑禹, 胡萍, 李珂, 李建平, 黄樟华

ZHENG Yu, HU Ping, LI Ke, LI Jian-ping, HUANG Zhang-hua

254 光斑尺寸对 42CrMo 钢激光深层淬火硬化层几何特征的影响

Effect of Spot Size on Geometrical Characteristics of Laser Deep Quenching Hardened Layer of 42CrMo Steel

张群莉, 童文华, 陈智君, 姚建华, 李铸国, 冯凯, Volodymyr S. Kovalenko

ZHANG Qun-li, TONG Wen-hua, CHEN Zhi-jun, YAO Jian-hua,

LI Zhu-guo, FENG Kai, Volodymyr S. Kovalenko

262 阴极保护检查片接地电阻数值模拟与实验研究

Numerical Simulation and Experimental Study of Grounding Resistance of Cathodic Protection Coupons

赵会军, 杜鹏宇, 董亮, 杜艳霞, 宋琳琳

ZHAO Hui-jun, DU Peng-yu, DONG Liang, DU Yan-xia, SONG Lin-lin

269 基于动态贝叶斯网络的海底管道点蚀疲劳损伤失效模型研究

Failure Model for Pitting Fatigue Damaged Pipeline of Subsea Based on Dynamic Bayesian Network

骆正山, 赵乐新, 王小完

LUO Zheng-shan, ZHAO Le-xin, WANG Xiao-wan

276 不同厚度 8YSZ 热障涂层的结构及性能表征

Structure and Properties of 8YSZ Thermal Barrier Coatings with Different Thickness

赵荻, 安宇龙, 赵晓琴, 刘光, 陈杰, 周惠娣

ZHAO Di, AN Yu-long, ZHAO Xiao-qin, LIU Guang, CHEN Jie, ZHOU Hui-di

285 超音速火焰喷涂 WC-10Co-4Cr 涂层的摩擦腐蚀性能研究

Tribocorrosion Behaviors of High Velocity Oxygen-fuel Sprayed WC-10Co-4Cr Coatings

黄博, 吴庆丹, 魏新龙, 肖金坤, 张嘎, 张超

HUANG Bo, WU Qing-dan, WEI Xin-long, XIAO Jin-kun, ZHANG Ga, ZHANG Chao

膜层材料与技术 Coating Material and Technology

294 基体表面粗糙度对激光沉积不锈钢形貌、组织及性能的影响

Effect of Substrate Surface Roughness on Morphology, Microstructure and Properties of Laser Deposition Stainless Steel

聂长武, 赵吉宾, 赵宇辉, 王志国, 何振丰, 高元, 王志勇

NIE Chang-wu, ZHAO Ji-bin, ZHAO Yu-hui, WANG Zhi-guo,

HE Zhen-feng, GAO Yuan, WANG Zhi-yong

304 Ti 对连续热镀铝锌熔池悬浮渣形成的影响

Effects of Ti on Formation of Suspending Dross in Continuous Hot Dip Galvanizing Al-Zn Molten Bath

王银军, 张杰, 徐勇, 江社明, 张启富

WANG Yin-jun, ZHANG Jie, XU Yong, JIANG She-ming, ZHANG Qi-fu

311 Cr 元素含量对 TC21 钛合金表面激光熔覆 Ni-Al 涂层组织与性能的影响

Effects of Chromium Element Content on Microstructures and Properties of Laser Cladding Ni-Al Coating on TC21 Titanium Alloy

张显, 胡记, 隋欣梦, 马欣然, 张维平

ZHANG Xian, HU Ji, SUI Xin-meng, MA Xin-ran, ZHANG Wei-ping

318 气体温度对冷喷涂 7075 铝合金涂层性能的影响

Effect of Gas Temperature on Properties of Cold Sprayed 7075 Aluminum Alloy Coatings

吴增荣, 胡永俊, 代明江, 张科杰, 小川和洋, 谢迎春, 黄仁忠

WU Zeng-rong, HU Yong-jun, DAI Ming-jiang, ZHANG Ke-jie,

Kazuhiro Ogawa, XIE Ying-chun, HUANG Ren-zhong

表面质量控制及检测 Surface Quality Control and Detection

326 预应力条件下系统颤振对磨削工件表面形貌的影响研究

Influences of System Chatter on the Ground Workpiece's Surface Topography under Prestress Condition

孙聪, 姚云龙, 修世超, 俞志鹏

SUN Cong, YAO Yun-long, XIU Shi-chao, YU Zhi-peng

336 磁力研磨法去除航空发动机涡轮轴内表面积碳的试验分析

Experimental Analysis of Removing the Carbon Deposition by Magnetic Grinding from the Inner Surface of an Aero-engine Turbo-shaft

徐会, 康仁科, 刘冬冬, 陈燕

XU Hui, KANG Ren-ke, LIU Dong-dong, CHEN Yan

343 研磨工艺对 18CrNiMo7-6 钢表面粗糙度和残余应力的影响

Effect of Lapping Process on Surface Roughness and Residual Stress of 18CrNiMo7-6 Steel

张银霞, 王文广, 郜伟, 于鑫, 杨鑫

ZHANG Yin-xia, WANG Wen-guang, GAO Wei, YU Xin, YANG Xin

349 光学元件表面离子束抛光过程边缘效应抑制

Edge Effect Suppression of Ion Beam Figuring Process on Optical Component Surface

李晓静, 王大森, 王刚, 张旭, 张宁, 裴宁, 聂凤明, 齐子诚

LI Xiao-jing, WANG Da-sen, WANG Gang, ZHANG Xu,

ZHANG Ning, PEI Ning, NIE Feng-ming, QI Zi-cheng

356 两种 DLC 涂层对 ZL108 铝合金干式铣削性能的影响

Effects of Two DLC Coatings on Dry Milling Performance of ZL108 Aluminum Alloy

张而耕, 张致富, 周琼, 黄彪, 陈强, 沈秀国, 陈亚楠

ZHANG Er-geng, ZHANG Zhi-fu, ZHOU Qiong, HUANG Biao,

CHEN Qiang, SHEN Xiu-guo, CHEN Ya-nan