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《电镀与表面精饰》专辑序言

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电镀与表面精饰属于工业电化学范畴,它是一门古老的科学,有着悠久的历史,在国民经济的众多领域发挥了重要的作用. 然而,由于受到资源、环境等问题的困扰,近年来其发展受到了严格的限制. 但是,机械制造、电力电子、仪器仪表、航空航天等诸多重要行业都离不开电镀与表面精饰. 在此背景下,就迫切要求广大电镀工作者奋发图强,不懈努力,不断开发新技术、新工艺,以适应新需求,以缓解资源、环境等方面的压力.

电镀与表面精饰涉及的领域比较广泛,主要包括:电镀、化学镀、阳极氧化、磷化、钝化、电解加工等. 这些技术共同的发展方向是:(1)所获得的表面膜层性能更加优异,包括耐蚀性、耐磨性、导电性、可焊性、稳定性等多种性能;(2)所采用溶液的化学组成更加简单,其主要成分更加低毒、无毒,并且尽量用廉价的原材料替代稀贵材料;(3)工艺操作更加简单,维护管理更加方便;(4)尽量降低生产成本,减少电能、热能等的消耗;(5)环境更加友好,在生产过程中要尽量减少或抑制废水、废气或废渣的排放等.

近年来,电镀与表面精饰技术的相关研究得到了迅速发展. 除从绿色、环保等方面出发开展了三价铬电镀、无氰电镀、无铬钝化等新技术、新工艺的研究外,还开展了熔盐电沉积稀有金属及其合金、离子液体电沉积特殊功能材料等方面的研究;在研究方法方面,除采用传统的电化学测试技术和表面分析技术外,还将量化计算、分子动力学模拟方法等应用到电镀液组成优化和镀层性能预测中;电镀与表面精饰技术业已突破了传统的技术领域,其在功能材料、纳米材料制造中的应用也越来越广泛. 结合上述研究方向,本专辑刊出由国内本领域六位知名教授受邀撰写的介绍最新研究成果的相关论文. 其中包括: 与电镀相关的"硫酸盐体系三价铬沉积机理及镀层表征"、"镀锡层上钛-磷复合体系钝化膜的制备与表征";与金属表面改性相关的"水热法制备铝合金超疏水表面及电化学性能研究";与电沉积纳米材料相关的"玻碳材料脉冲电沉积纳米晶体镍的制备及其性能研究"、"激光刻蚀模板中电沉积特殊结构 CIGS 薄膜"; 与离子液体电沉积相关的"镍离子对中磷镍基体氯化胆碱无氰浸金表面的改善".

最后,对本专辑的所有作者、审稿人及编辑部工作人员的辛勤工作和付出表示由衷的感谢!

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Preface for Special Issue on Electroplating and Surface Finishing

Electroplating and surface finishing, which belongs in the category of electrochemical industry, is an ancient science having a long history and playing an important role in many fields of the national economy, for instance, machinery manufacturing, power electronics, instrumentation and aerospace. However, researches and developments in electroplating and surface finishing have been significantly impeded due to the resources constraints and environmental concerns. It is, therefore, urgent for the general electroplating scientists and engineers with unremitting efforts to develop new technologies and new processes to meed the new demands in order to relieve the pressures in resources and environments.

The disciplinary of electroplating and surface finishing covers a variety of fields including electroplating, electroless plating, anodizing, phosphating, passivation, and electrolysis. The common developing directions toward new technologies related to those areas are: (1) the preparation of surface layers with more excellent performances, namely, corrosion resistance, wear resistance, conductivity, weldability, stability; (2) the use of solutions containing less complex, lower toxic or nontoxic, and less expensive chemical compositions; (3) the application of more simplified operation process for achieving more convenient maintenance and management; (4) the decrease in production costs, and consumptions of power and heat; (5) the reduction or suppression in the production process for the emissions of waste water, waste gas and waste residue as far as possible to make an environment more friendly.

In recent years, the researches in electroplating and surface finishing technology have been developed rapidly. From the aspects of green and environmental protections, new technologies such as trivalent chromium electroplating, cyanide free electroplating and chromium free passivation have been explored. In addition, electrodepositions of rare metals and their alloys from molten salts electrolytes and electrodepositions of special functional materials from ionic liquids electrolytes have also been studied. In terms of research methods, besides the traditional electrochemical techniques and surface analysis technologies, quantum chemical calculations and molecular dynamics simulations have been applied to optimize compositions of electrolytes and to predict the properties. Electroplating and surface finishing technologies have already broken through the traditional realm, making more and more wide applications in the manufactures of functional materials and nano materials.

Combining with the above research directions, I am glad to present in this special issue the latest publications, which are written by six distinguished professors in the fields. These publications include: two papers related to electroplating titled “Deposition Mechanism and Coating Characterization for the Trivalent Chromium Electrodeposition in Sulphate Electrolyte” and “Preparation and Characterization of Titanate-Phosphate Passivation Film on Tinplate”; one paper related to metal surface modification titled “Superhydrophobic Surface on Aluminum Alloy by Hydrothermal Method and Its Electrochemical Performance”; two papers related to electroplating of nano materials titled “Preparation and Properties of Nanocrystalline Nickel by Pulse Electrodeposition on Glassy Carbon” and “Electrodeposition of CIGS Thin Film with Special Structure Using Laser Etching Template”; and one paper related to ionic liquid electroplating titled “Surface Ehancement of Nickel Ions on Cyanide Free Immersion Gold Deposited from a Chloroauric Acid-Choline Chloride Solution on Medium-Phosphorus Nickel”.

I would like to take this opportunity to acknowledge all the participants, authors, reviewers, and editorial staffs of *Journal of Electrochemistry* for their excellent and professional contributions to this special issue.

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