Editorial

Special Metal-Alloy Coating and Catalysis

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Special metal alloy coating is an important material technology that has a wide range of applications in many fields. It combines the characteristics of special alloy materials and surface coating technology to provide excellent properties and enhanced functions for materials. Catalysis is a process that increases the reaction rate without being consumed by intervening in the chemical reaction process. Catalysis can be applied to various chemical reactions, thereby increasing the reaction rate, improving product selectivity, and enhancing reaction efficiency. Special metal alloy coatings and catalytic technology have broad application prospects. They can improve material properties, increase reaction efficiency as well as product selectivity, and promote the development of environmentally friendly chemical processes. With the continuous advancement of science and technology in addition to the increasing demand for high-performance materials and efficient chemical reactions, special metal alloy coatings and catalytic technologies will continue to play an important role, bringing more benefits to applications in various fields.

This Special Issue will provide a snapshot of the state of the art in metal, alloy coating and films. These metals, alloy coatings and films can act as corrosion and oxidation resistance barriers as well as catalysts for water splitting, among other catalysis applications.

Ten contributions (nine articles and one review) have been published in this Special Issue, covering the research topics of the fracture of metal parts, progress in coating growth and characterization techniques, processing condition–structure–property relations, the development of novel lubricants and advanced simulations relevant to tribological contacts and metal manufacturing, and the structural, morphological, corrosion, oxidation, wear, and catalysis properties of thin films.

Lebedeva et al. [1] reviewed the possibilities and future perspectives of the electrochemical deposition of bimetallic compositions and alloys containing Fe, Co, Ni, Cr, W, and Mo. In addition to deposition from aqueous (classical) solvents, the advantages and perspectives of electrochemical deposition from ionic liquids (ILs) and deep eutectic solvents (DES) are briefly discussed.

For the phenomenon of metal fracture, Liu et al. [2] explored the causes of the fracture of the gearbox boom, and found that the nature of suspension rod fracture belonged to fatigue fracture. Dong et al. [3] investigated the shear transformation zone and its correlation with the fracture characteristics of FeSiB amorphous alloy ribbons in different structural states.

Ding et al. [4] investigated the effects of Ce content on the microstructures and mechanical properties of Al-Cu-Li alloys, and provided an economical as well as convenient method for improving the properties of Al-Cu-Li alloys via the addition of Ce.

In terms of coating preparation, Xu et al. [5] successfully prepared Ni/Cu/Ni multilayer coatings on glass-fiber-reinforced PEI resin via sandblasting and the activation/acceleration of a two-step metallization process. The influence of acceleration on the appearance quality of metallization on the PEI substrate was studied, and, at the same time, the mechanism of acceleration was investigated and addressed. Dobránsky et al. [6] optimized the deposition process of electrophoretic paints, after which they then analyzed and evaluated the thickness of a cataphoresis layer formed on an aluminum substrate.
Shan et al. [7] studied the effect of a tungsten arc melting current on the microstructure and wear resistance of FeCrMnCuNiSi$_1$ coatings prepared from high-entropy powder-cored wire, and studied the influence of a melting current on the wear resistance of the coatings.

Huang et al. [8] used an image processing program to extract the dynamic behavior characteristics of the droplet transition and the weld pool in high-speed photography. The influence of the current waveform on the arc pressure and the impact of the droplet were quantitatively analyzed with different parameters.

Meng et al. [9] reported a nitrogen-doped biomass carbon (1NC@3)-based composite cobalt selenide (CS) heterojunction, which was prepared via a solvothermal method using kelp as the raw material. Structural, morphological, and electrochemical analyses were conducted to evaluate its performance. The overpotential of the CS/1NC@3 catalyst in the OER process was 292 mV, with a Tafel slope of 98.71 mV·dec$^{-1}$ at a current density of 10 mA·cm$^{-2}$. The presence of the biomass carbon substrate enhanced the charge transport speed of the OER process and promoted the OER process, confirmed by theoretical calculations. This study provided a promising strategy for the development of efficient electrocatalysts for OER applications.

Gruber et al. [10] used some advanced measurement techniques, such as transmission electron microscopy (TEM) and Auger electron as well as X-ray photoelectron spectroscopy (AES, XPS), to characterize the oxide layer of aluminium alloy surfaces. The results illustrated in detail the strengths and weaknesses of each measurement technique. The XPS technique was proven to be the most reliable method to reproducibly quantify the average oxide thickness.

This Special Issue was well supported by a diverse range of submissions. In this Special Issue, there are various topics relating to special metal alloy coating and catalysis. It shows the latest research results of the authors. However, many issues in this area of research have not yet been explored and the dissemination of these results should be continued. As a Guest Editor, I hope that the research results presented in this Special Issue will contribute to the further progression of research on special metal alloy coating and catalysis.

Finally, I would like to thank all of the reviewers for their input and efforts in producing this Special Issue, as well as the authors for the papers that they have prepared.

**Conflicts of Interest:** The author declares no conflict of interest.

**References**

2. Liu, W.; Xu, Z.; Liu, H.; Liu, X. Cause Analysis and Solution of Premature Fracture of Suspension Rod in Metro Gear Box. *Metals 2022*, 12, 1426. [CrossRef]


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