



Special Issue: "Advanced Hybrid Coatings and Thin Films for Surface Functionalization"

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Editorial

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Abstract: Many technologically advanced materials and components are characterized by surfaces with special coatings. The role of the coatings is not only the traditional one (protection and aesthetics), but, in addition, new advanced functions are required, such as special mechanical, chemical, electrical, and optical functions. A wide range of coating technologies offer the possibility to produce advanced and selected surface properties, such as hydrophobic or hydrophilic coatings, non-stick and easy-to-clean coatings, anti-freeze or anti-fogging coatings, scratch-resistant coatings, and anti-microbial coatings, etc. In particular, organic–inorganic hybrid coatings are very promising materials for new coatings functionalization and applications in many different industrial fields. The aim of this Special Issue is to provide an update of the most advanced research in the design, synthesis, and development of hybrid coatings/thin films, and their applications for surface functionalization, showing the innovation trends and promoting further research in this area.

Keywords: hybrid coatings; thin film; corrosion protection; graphene; wear resistance; anti-fouling coatings

Industrial applications of new advanced materials often require surface functionalization and this result can be obtained using coating and thin films [1]. For many years, surface coatings were required to perform primarily the function to protect the metal surface, both chemically and mechanically, as well as determining its color. Multifunctional properties are now increasingly required, which also include electrical, tactile and biological interaction properties with the environment [2]. Organic–inorganic hybrid coatings are very promising materials for new coatings functionalization and applications in many different industrial fields, offering the possibility to produce advanced and selected surface properties. The behavior and interactions in humid environments, the sanitizing and surface cleaning properties, the interaction with solar radiation, are just a few examples in this area [3,4].

The aim of this Special Issue is to provide an update of the most advanced research in the design, synthesis, and development of hybrid coatings/thin films, and their applications for surface functionalization, showing the innovation trends and promoting further research in this area.

The seven papers composing the Special Issue [5–11] offer an interesting and wide window of the developments of functionalized hybrid coatings and thin films, from various and differentiated points of view.

One of the most important sectors in the development of new thin films and pre-treatment concerns the surface finishing of aluminum, in particular with the aim to increase the durability in aggressive environments.

First, an interesting work is the paper of Mujdrica et al. [5], which describes an accurate study of the mechanisms of action of pre-treatments on AA3000 aluminum alloys based on trivalent chromium and zirconium salts. These pre-treatments have also been commercially available for some time, but their mechanism of action, in different exposure environments, has not yet been fully understood.

Further work on aluminum alloys includes the paper of Neves et al. [6] where layered double hydroxide films are developed on the aluminum alloy AA2024 with excellent properties of increasing corrosion resistance and biocidal properties to avoid excessive development of biological fouling. These two papers are good examples of two different approaches to the research topic: the development of new pre-treatments [6] and the better understanding of the pre-treatments currently in use [5].

The property of organic coatings related to the interaction with biological activity is also the subject of the work of Faria et al. [7], where the performance of different protective coatings concerning the formation of marine fouling is experimentally evaluated.

Two further works [8,9] show two interesting aspects of the research and innovation developments in a very promising and developing technological sector: the hybrid coatings world.

The development of new polyorganosilazane-based hybrid coatings for the corrosion protection of ferrous substrates is described in the work of Fedel et al. [8]. The work of Ortelli et al. [9] describes an interesting development of hybrid coatings in a completely different sector, the textile one, with particular attention to the properties of thermal insulation and water resistance.

In the field of hybrid coatings and thin films, nanotechnologies are playing an important role, boosting innovation. An example is the paper by Calovi et. al [10], where a new and interesting material, graphene [12], is used to develop new corrosion protective coatings deposited by cataphoresis, improving also the tribological properties.

Abrasion resistance properties are the final aim of the work of Mousavi et al. [11], where composite coatings of metallic nature are studied with regard to morphology and mechanical properties.

This Special Issue is a helpful tool for researchers working in the field, for appreciating the state of the art, and to have an overview of the new innovative trend in the field of hybrid coatings and thin films for surface functionalization.

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

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