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Editorial

Advances in processing and characterization of conversion coatings

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There is an ongoing demand for metal surface properties improvement. New films with altered physical and chemical properties that provide the substrates with new functionalities are increasingly examined and widely disseminated. One of the broadly used traditional surface modifications is conversion coatings (CC), formed in situ on a metal surface by the chemical or electrochemical reaction of the metal substrate with anions in the solution. New synthesis routes and performances of CCs are emerging with requests spanning from better appearance, increased adhesion, hardness, wear or lubricity, and corrosion protection.

The present special issue of the Journal of Electrochemical Science and Engineering presents contributions on various kinds of non-toxic conversion coatings on different metal substrates: steel, stainless steel, zinc, copper, aluminum, and the broad range of their properties and applications. Different functions require surface science and surface engineering at a molecular level and are related to the chemical, phase and morphological nature of their surfaces.

The effect of stainless steel annealing on the adhesion of TiO_2 spray coating was discussed in [1]. Another novel approach to enhancing adhesion was proposed in [2], by a two-step synthesis of porous indium phosphide with nickel oxide crystallites, as a potential material in modern electronic instrumentation. The influence of ultrasound intensities on hydrodynamic conditions in copper coatings electrodeposition was analyzed in [3]. Besides Pt, as an inert electrode, the thiophene synthesis by electropolymerization was successfully attained also on various oxidizable metals: Ti, Ni and stainless steel, *via* soluble oligomers of thiophene, as described in [4]. Superhydrophobicity, showing strong water-repellency, is an important property in many applications. The production of metal textured surfaces with uniform superhydrophobic properties using laser texturing was presented in [5]. In the research in [6], a high-velocity oxy-fuel thermal spraying technique was applied to deposition WC-10Co-4Cr coatings reinforced with yttria-stabilized zirconia (Y_2O_3/ZrO_2; YSZ) nanoparticles on steel turbine.

The second group of articles presented in this special issue is related to new achievements in tailoring CCs for corrosion protection. The sacrificial ZnFe alloy coating electrodeposited on steel was further modified by a hybrid sol-gel silane coating [7], while electrodeposited Zn coating on steel was modified by electroless cerium oxide layer deposition and additional sealing in boiling

water [8]. Ce was also used in [9] as a dopant in hydrotalcite-type protective chemical conversion coatings on aluminium alloy AA 7075. Finally, the effect of tannic acid embedded in polystyrene coatings either directly or within mesoporous silica-nano-containers on the corrosion protection of steel and zinc substrates was discussed in [10].

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