Editorial

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We are pleased to deliver the second issue of 2019 with an Invited Feature Article, two Innovation Letters and four Original Research Articles.

Magnesium (Mg) alloy development has been driven by demands for lighter structural materials in aerospace, automotive and railway industries to reduce fuel consumption and carbon dioxide emissions, as well as by recent investigations into resorbable biocompatible materials to replace permanent corrosion-resistant materials in many medical implants. Control of their environmental behavior is important for practical applications of these magnesium alloys, thus understanding the corrosion and oxidation of magnesium alloys is necessary. The research team from the University of Queensland in Australia, led by Professor Andrej Atrens, offers a comprehensive overview of the research on oxidation of magnesium alloys.¹ Through analysis of the influence of alloying elements on oxidation, the authors also direct the readers to promising theoretical models that could provide guidance in development of new oxidation-resistant magnesium alloys.

In the first Innovation Letter, Rad *et al.*² describes an exploratory study on the effect of crystallographic orientation of two different types of titanium (Ti) surfaces on hydroxyapatite formation and the behavior of mesenchymal stem cells. It is not uncommon that very similar materials show differences in biological responses due to differences in the surface finish. However, the report presented by Rad *et al.* additionally demonstrates that crystallographic orientation of inorganic material can favor hard tissue regeneration, and therefore can be used in designing implants with improved biological activity, and likely improved biocompatibility. While this exploratory study is limited in scope, with only two substrates and a limited number of parameters of cell behavior recorded, it could reopen interest in studies on biological activities of single crystals.

The second Innovation Letter is concerned with a special feature of the velocity field on the surface of a Leidenfrost droplet.³ Johann Gottlob Leidenfrost (1715–1794) was the German physician who published a treatise on the behavior of liquid drops on a very hot plate. The droplet is levitated above the hot plate by an insulating vapor layer that prevents the droplet from rapid boiling. In his letter, Bormashenko analyzes the motion and rest of a Leidenfrost droplet using the Poincaré–Brouwer theorem. He proves theoretically that points of zero velocity arise on the droplet surface at rest and when droplets are self-propelled.

In the first Original Research Article, Cao *et al.*⁴ describe the application of highly alkali-resistant disperse dyes in the alkali dewetting and dyeing of polyester textiles in a one-step process. This invention has great applied potential to simplify the technology of polyester fabric processing and reduce the fabric cleaning process. Therefore, it appears to be an environmentally sustainable and energy-saving technology for the dyeing and finishing of polyester textiles.

Nowicki⁵ applied the coupled map lattice (CML) method to investigate dewetting phenomenon of thin liquid films on lyophobic solid surfaces. The simulations provide useful data on both the kinetics of the dewetting process and the liquid mass distribution in the liquid film rupture product. Importantly, the CML model is capable of adequately representing key features of experimentally observed wetting behavior and is rather versatile for adjusting to different specific conditions.

An interdisciplinary and interinstitutional team of researchers from Turkey report improved bacterial anti-fouling properties of medical grade silicone surfaces that were functionalized via a plasma polymerization technique using diethyl phosphite as a precursor.⁶ Bacteria anti-fouling properties were evaluated through a series of in vitro tests including nonspecific Bovine serum albumin protein adsorption, cytotoxicity studies using mouse fibroblast cells and bacterial adhesion tests using a slime-forming *Staphylococcus epidermidis* strain. They also conducted in vivo bacterial adhesion tests, where silicone samples with pre-seeded *S. epidermidis* bacteria were implanted into rats. All tests confirmed anti-fouling properties of the invented functionalized silicone surface against bacteria and protein.

In the last paper of this issue, Sengur-Tasdemir *et al.*⁷ from Istanbul Technical University in Turkey present a detailed study on cloning of aquaporin Z protein, and the preparation of nano-filtration membranes made of liposomes with aquaporin Z for purification of water.⁷ They investigated the effect of aquaporin Z addition on liposome characteristics and behavior by evaluating the adsorption performance of proteoliposomes onto membranes prepared through a spin-coating technique. The results demonstrated successful cloning of aquaporin Z protein from *Escherichia coli* C43 strain and its incorporation into liposomes, and concluded with membranes having water permeability increased almost five- to six-fold as compared to liposome membranes free of proteins.

We hope that everyone will enjoy reading the content of this issue.

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