Editorial

Jaroslav Drelich

Department of Materials Science and Engineering, Michigan Technological University, Houghton, MI, USA

Ludmila Boinovich

A.N. Frumkin Institute of Physical Chemistry and Electrochemistry, Russian Academy of Sciences, Russia

Ziqi Sun

Queensland University of Technology, Brisbane, Australia

The *Surface Innovations* journal proudly marks and celebrates its 10th anniversary in 2022; a notable milestone that could not have been accomplished without contributions from many research teams, enthusiastic editorial board members, devoted external reviewers, and the support received from the ICE publishing crew and managing office.

The founding journal's editorial team was assembled in 2012, with the journal's first volume debuting in 2013. In celebration of our 10th anniversary, the journal offers six issues in 2022, with each issue led by an invited feature article, prepared by well-respected researchers in the fields of surfaces, coatings, interfacial science, and engineering.

Over the past nine years, the journal has become one of the top interdisciplinary and international journals offering articles on scientific and engineering advances made in the formulation of novel functional materials, nanomaterials and coatings, modification and functionalization of surfaces, understanding and computer simulation of interactions between surrounding phases and surfaces/interfaces, the behaviour of materials and coatings under corrosive and degradation conditions, and many others.

The published reports reveal research efforts in wetting and adhesion science, formulation of novel medical biomaterials with their engineered surfaces and coatings, antimicrobial and antifungal materials and coatings, electronic materials, and energy storage materials, as well as their processing or recycling.

The 10th volume opens up with an Invited Feature Article prepared by the research team led by Professor Jing Wei from the Beijing Institute of Technology, China.¹ This review article provides a unique and in-depth overview on the recent advancements made in the study and understanding of defects and their passivation in perovskite solar cells. The authors discuss the causes, the distribution and classification of defects in perovskite solar cells, their influences on the performance of the devices, and the main defect passivation strategies, including low-dimensional composition, Lewis bases and contact passivation, etc. It is an insightful perspective from the viewpoint of defect generation, influence, and passivation mechanisms. The authors' discussion on some remaining challenges and possible solutions in the commercialization of perovskite solar cells and the defect-passivation strategies, including dimensional engineering, interface passivation and carrier transport layer passivation,

should attract the attention of researchers working on perovskite solar cells, and should also be of broad interest.

In the Innovation Letter, Boinovich, and her collaborators describe their study on contact angles during the sessile-drop measurements in unsaturated and saturated water-vapor environments.² The measuring method consists of digital video images processing, along with Laplace fitting optimization.

The Laplace fitting algorithm allows the determination of two droplet apex coordinates: the liquid vapor interface curvature at the apex and the ratio of the surface tension to the density of the liquid, which leads to the calculation of surface tension if the water density is known. The knowledge of the surface tension to density ratio also makes possible a non-perturbative estimate of the actual temperature of the droplet and the local humidity of the surrounding atmosphere. The quantitative assessment of the time variation of droplet diameter, (receding) contact angle, surface-tension-to-density ratio and droplet temperature, is very interesting, and it provides very useful information about the correct application of the sessile drop technique in an unsaturated atmosphere, particularly when long duration measurements are required.

In the first Original Research article of this issue, Ivvala *et al.* describe a simple, inexpensive, and environmentally friendly approach for fabrication of nanoflake-structured aluminum surfaces through a combination of hot water treatment and abrasive machining.³ The hierarchically structured metal surfaces exhibit superhydrophilicity, but can also be altered to superhydrophobic surfaces after a surface silanization process. Manipulating surface feature dimensions down to the nanoscale has revealed the possibilities of controlling wetting states and the durability of hierarchical surfaces by controlling the interspatial distances rather than the surface feature horizontal dimensions. Antifogging, anticorrosion, rain and weather-testing of fabricated aluminum surfaces demonstrates high durability of the invented fine-structured hierarchical surfaces.

In the next article, Chen *et al.* demonstrate a one-step chemical deposition method that involves myristic acid, in modification of a copper-porous foam (having a pore size distribution from 100 to 300 microns), to fabricate a durable superhydrophobic substrate that can be used as a mesh for purification of oil from dispersed water.⁴ The superhydrophobic meshes also demonstrate

self-cleaning and antifouling performances. Chemical and mechanical stability tests have confirmed that the foam's superhydrophobicity can be retained under harsh environmental conditions of storage and aggressive testing in alkaline, acidic and high electrolyte content solutions, as well as for foams exposed to mechanical abrasion.

Since the emergence of nanotechnology and nanomaterials at the end of the 20th century, concerns on their impact and toxicity to living organisms and plants have intensified. In unique studies conducted in Poland, Gorczyca *et al.* investigated the phototoxicity of silver nanoparticles (AgNPs) of varying surface properties as controlled by the synthesis technology, using three different stabilizing agents, including hexametaphosphate, tannic acid, and citrate.⁵ The authors report a strong influence of the phototoxic effects of AgNPs towards *Triticum aestivum* seedlings, which is manifested in the disruption of physiological processes in the plants that produces reduced seed germination and obstructed growth of roots and leaves that is mainly caused by damage to the plants' cells. Studies revealed that the citrate-stabilized AgNPs were the least toxic to the seedlings.

Oxygen-transporting membranes with a high tolerance towards CO₂ have the great potential to be used in air separation and oxy-fuel combustion. In a new contribution, Zhang *et al.* propose a novel Co-free dual-phase oxygen transport membrane with good oxygen permeability and structural stability under CO₂ atmosphere.⁶ The authors report systematic studies of the microstructure and oxygen permeability of an invented dual-phase membrane made of Ce_{0.8}La_{0.2}O_{2-δ}-La_{0.1}Sr_{0.9}Cu_{0.2}Fe_{0.8}O_{3-δ} (LDC-LSCF). The oxygen permeable flux reached by the invented membrane was 0.37 (ml/min)/cm² using a pure CO₂ sweep gas, which is better than that reported previously for Co-free dual-phase membranes.

A research team from Slovakia reports a unique invention using a keratin material to capture nitrates in aqueous solutions.⁷ The researchers modified a sheep wool with hydrochloric acid to reverse a negative wool surface charge to a positive one; a result of protonation of the amino and hydroxy functional groups. The nitrate adsorption studies that were conducted, and theoretical analysis performed using eight isotherm models, revealed physical and chemical inhomogeneities of the wool surface. The study opens up the opportunity to utilize environmentally friendly, biocompatible and degradable biomaterial waste of sheep wool, especially from coarse-haired breeds, to remove excessive amounts of nitrates, which is responsible for accelerated

eutrophication from wastewater streams entering streams, rivers and lakes.

Removal of the pollutants from aqueous systems is also the subject of an invention developed at the University of Electronic Science and Technology of China, and it is the last contribution to this issue. Liu *et al.* demonstrate the synthesis of polyethyleneimine (PEI)-modified magnetite (F₃O₄) using a one-step coprecipitation method.⁸ PEI-modified F₃O₄ nanoparticles adsorb anionic dyes in aqueous solutions, and the adsorption process can be modeled by pseudo-second-order kinetics. These new magnetic nanoparticles are stable at pH 2-10 and are highly efficient in removing Congo red, which is an anionic dye containing aromatic rings that is a common organic pollutant discharged from textile, cosmetic and biomedicine factories.

We would appreciate any feedback and valuable suggestions from contributing authors and readers on any developments to the *Surface Innovations* journal that could make it more appealing to them in the years to come.

REFERENCES

1. Li Y, Li Z, Liu F and Wei J (2022) Defects and passivation in perovskite solar cells. *Surface Innovations* **10**(1): 3–20, <https://doi.org/10.1680/jsuin.21.00058>.
2. Chulkova EV, Emelyanenko KA, Emelyanenko AM and Boinovich LB (2022) Elimination of wetting study flaws in unsaturated vapors based on Laplace fit parameters. *Surface Innovations* **10**(1): 21–24, <https://doi.org/10.1680/jsuin.21.00012>.
3. Ivvala J, Mandal P, Arora HS and Grewal HS (2022) Facile approach for modulating wetting of hierarchically structured metallic surface. *Surface Innovations* **10**(1): 25–36, <https://doi.org/10.1680/jsuin.20.00077>.
4. Chen D, Sheng Y, Kang Z and Li W (2022) One-step deposition of stable superhydrophobic coatings with controllable wettability. *Surface Innovations* **10**(1): 37–47, <https://doi.org/10.1680/jsuin.21.00001>.
5. Gorczyca A, Pocięcha E, Maciejewska-Prończuk J, Kula-Maximenko M and Oćwieja M (2022) Phytotoxicity of silver nanoparticles and silver ions toward common wheat. *Surface Innovations* **10**(1): 48–58, <https://doi.org/10.1680/jsuin.20.00094>.
6. Zhang X, Chen T, Xu Y, Sun C and Wu C (2022) A novel cobalt-free and CO₂-stable LDC-LSCF membrane with high oxygen permeability. *Surface Innovations* **10**(1): 59–67, <https://doi.org/10.1680/jsuin.21.00007>.
7. Porubská M, Cvik M, Jomová K, Branišová Z and Braniša J (2022) Nitrate removal from aqueous solution by way of adsorption on modified sheep wool. *Surface Innovations* **10**(1): 68–75, <https://doi.org/10.1680/jsuin.21.00006>.
8. Liu Y, Gan Y, Zhao C *et al.* (2022) Polyethyleneimine-modified magnetite prepared without a base to remove Congo red in water. *Surface Innovations* **10**(1): 76–85, <https://doi.org/10.1680/jsuin.21.00006a>.