Editorial

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Surface Innovations debuted with the first issue in March 2013, and 2020 delivers the eighth volume. Over the period of seven years, the journal has become one of the top interdisciplinary and international journals offering articles on scientific and engineering advances made in formulation of novel functional materials, nanomaterials and coatings, modification and functionalization of surfaces, and understanding or computer simulation of interactions between surrounding phases and surfaces/interfaces, behavior of materials and coatings under corrosive and degradation conditions, and many others. The published reports reveal research efforts in formulation of novel medical biomaterials, antimicrobial and antifungal materials and coatings, electronic materials and energy storage materials, as well as their processing or recycling. Despite the broad range of topics covered by the journal in the first seven years, the journal's strength has always been in the area of wetting and contact angles. For example, the all-time five top cited papers for *Surface Innovations* are

1. 'Guidelines to measurements of reproducible contact angles using a sessile-drop technique'¹
2. 'Contact angles and wettability: towards common and accurate terminology'²
3. 'Physics and applications of superhydrophobic and superhydrophilic surfaces and coatings'³
4. 'Superoleophobic surfaces: design criteria and recent studies'⁴
5. 'Understanding the anti-icing behavior of superhydrophobic surfaces'.⁵

With the Invited Feature Article in this combined issue,⁶ the journal proudly marks a one-of-a-kind contribution on the history of contact angles, their meaning and use in polymer surface energy estimation. This is a notable milestone, prepared by an international team of experts in the field of wetting. There has been no similar historical perspective on the origins, evolution, scientific use and healthy criticisms of the existing interpretations of contact angles offered by any other journal. This historical review will well serve researchers across the disciplines, guiding the readers into the scientific meaning of contact angles and their limitations, and providing directions for new developments in the area of science of contact angles.

In this combined issue, we also offer nine original research contributions. In the first technical report,⁷ the transition criteria between the Wenzel and Cassie-Baxter states of a droplet on cylindrical arrays are investigated using surface free energy

analysis and analyzing the shape of the three-phase contact line. Four cases discussed include liquid droplets in the Wenzel and Cassie-Baxter states during both advancing and receding modes. The readers might find this theoretical analysis a useful direction into design and analysis of superhydrophobic patterns made of cylindrical posts.

In the second technical report, Gaynanova *et al.*⁸ describe a novel route for the synthesis of cadmium selenide (CdSe) quantum dots stabilized by polyethyleneimine and chitosan. The nanocomposites synthesized are then embedded into polyelectrolyte multilayer capsules. The resulting water-soluble low-toxicity chitosan-based capsules, having a prolonged fluorescence response, are additionally susceptible to covalent attachment to antibodies, and therefore could be used in bioimaging during drug delivery to local disease sites in medical treatments.

Then, Rahmati *et al.*⁹ report on formulation of novel heterostructures, made of gold (Au)-incorporated vertically aligned zinc oxide (ZnO) nanorod array/copper sulfide (CuS) hybrid, having high photocatalytic activity. The heterostructures were formulated using a low-temperature chemical approach, magnetron sputtering deposition and ionic layer absorption and reaction method. The formulated heterostructure showed enhancement in light harvesting, photosensitivity, photocatalytic degradation and photoelectrochemical conversion, and should inspire research on materials for electrochemical cells.

There is not much research done on either recycling or reuse of the expired medications. In the new contribution, the research team from Kunming University of Science and Technology in China¹⁰ reports the use of expired zinc gluconate medication, popular as a zinc micronutrient supplement needed for healthy body tissue. The authors demonstrate formulation of a zinc oxide/carbon (ZnO/C) material using a hydrothermal reaction and pyrolysis, with zinc gluconate as a raw material. The carbon microspheres were coated with the zinc oxide/carbon composite and the carbon content was controlled by tailoring the hydrothermal reaction time. The formulated zinc oxide/carbon composite with core-shell structure exhibited promising electrochemical characteristics and showed good performance for lithium storage applications.

In the article prepared by another research team from China, Wang *et al.*¹¹ report the synthesis of γ -alumina (Al₂O₃) yolk-shell

meso-macroporous microspheres, prepared by a glucose-assisted hydrothermal method. The hierarchically assembled $\gamma\text{-Al}_2\text{O}_3$ yolk-shell microspheres exhibited a specific surface area of above $200\text{ m}^2/\text{g}$, with a wide pore size distribution from 2 to 140 nm. The microspheres were successfully tested for the adsorption of Congo red dye from aqueous solutions, and the authors found that the adsorption follows the Langmuir isotherm and pseudo-second order kinetics. The $\gamma\text{-Al}_2\text{O}_3$ yolk-shell microspheres could serve the dye industry in removal of dyes from water and wastewater streams, but application of these porous materials could also be expanded to areas of catalysis and sensors.

The inter-institutional team of researchers from Iran¹² reports on enhancement of hydrophilicity of electrospun polyethylene terephthalate (PET) fibers through nanosecond pulsed plasma treatment, followed by coating the PET fibers with chitosan in an effort to improve biocompatibility of possible tissue engineering scaffolds made of PET/chitosan. Plasma treatment of PET fibers significantly improved affinity of these fibers towards water by introducing oxygen-based functional groups such as carboxyl, hydroxyl, carbonyl, carboxylic acid, aldehydes and esters, along with enhancement in surface microroughness. All these factors contributed to enhancement in the quality of chitosan coating, offering PET mats with high water absorption.

Polyurethanes are considered promising polymers for vascular scaffolding but their biocompatibility and hemocompatibility would benefit from enhanced surface interactions with the vascular environment. In the contribution by Butruk-Raszeja *et al.*,¹³ the authors describe a functionalization of polyurethane surface through acrylic acid grafting and subsequent introduction of a peptide containing arginine–glutamic acid–aspartic acid–valine sequence (REDV). This modification improves compatibility of the polymer with blood and promotes endothelialization, which could pave the way toward innovations in novel hybrid implants coated with cells (or tissue).

Polyacrylonitrile (PAN) fibers are widely used for clothing and their coloration relies on conventional dyeing technologies involving coloring dyes, a portion of which end up in wastewater streams. To reduce environmental hazards, dye-free coloration technologies are under development. Cao *et al.*¹⁴ describe a modification of PAN fibers for acquiring both decorative color and flame retardancy enhancement. These two goals were achieved by treating the PAN fibers with triethylene tetramine, followed by impregnation in sodium hydroxide (NaOH) solution.

In the last contribution to this issue, Devgan and Sidhu¹⁵ describe electrical discharge machining (EDM) technology capable of treating titanium (Ti)-based alloys to improve their wear resistance. The authors demonstrate a deposition of multiwalled carbon nanotubes and hydroxyapatite coating on $\beta\text{-Ti}$ alloy. The EDM process caused formation of hard phases including titanium

carbide, niobium carbide and tungsten carbide, which are responsible for increased microhardness and wear resistance of the alloy. Formulation of multiwalled carbon nanotubes reduced the coefficient of friction on the alloy surface.

We hope that you will find this first issue of 2020 interesting and useful to your research projects. As always, we appreciate your comments and suggestions.

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