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Editorial

10th Anniversary of Applied Sciences-Invited Papers in Chemistry Section

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MDPI´s *Applied Sciences* reached a remarkable milestone in 2020 when the 10th volume of the journal was published and an impact factor of 2.474 was achieved. To celebrate this special occasion, the Chemistry Section has produced a special issue based mainly on invited papers to mark "The 10th Anniversary of Applied Sciences". This Special Issue consists mainly of 12 original research articles and 1 comprehensive review featuring important and recent developments in analytical chemistry, environmental chemistry, nanomaterial chemistry, polymer/coating chemistry, drug delivery chemistry, and flavonol chemistry.

Three of the featured articles are in the broad area of *analytical chemistry*. In one of these papers, Roverso et al. [1] explored the use of a mixed cationic-reverse phase column coupled to high-resolution tandem MS (HR-MS/MS) for the analysis of small highly polar metabolites in biological fluids at low concentrations. They successfully retained and separated trimethylamine N-oxide (TMAO) and the isobaric molecules beta-methylamino-L-alanine (BMAA) and 2,4-diaminobutyric acid (DAB). When applied to plasma and urine samples, they achieved linear concentration ranges of 50–1000 µg/L and 500–10,000 µg/L for TMAO and both BMAA and DAB, respectively. The effectiveness of the method was also investigated for biologically relevant compounds and those with a wider range of polarities. This approach consequently enabled the simultaneous analysis of a larger range of metabolites, from very small and polar compounds to quite lipophilic molecules. In another study, Avino et al. [2] employed ultrasound vortex-assisted dispersive liquid–liquid microextraction and gas chromatography coupled to ion trap mass spectrometry for the determination of non-steroidal anti-inflammatory drugs (NSAIDs) in animal urine samples. The urine samples were initially treated with β-glucuronidase/acrylsulfatase before extracting the NSAIDs with CH_2Cl_2 by the ultrasound vortex-assisted dispersive liquid–liquid microextraction method. They achieved an enrichment factor of about 300–450 times by this approach, with 94.1 to 101.2% recoveries and a relative standard deviation (RSD) of $\leq$4.1%. The achieved limits of detection (LODs) and limits of quantification (LOQs) were 0.1–0.2 ng mL^{-1} (RSD $\leq$ 4.5%) and 4.1–4.7 ng mL^{-1} (RSD $\leq$ 3.5%), respectively. Cordeiro et al. [3] synthesized rapid and cheap MoS_2 nanostructures on paper substrates through microwave-assisted hydrothermal synthesis for the production of low-cost near-infrared photodetectors. The best results were obtained with the interdigital MoS_2 photodetector by using photoactive MoS_2 nanosheets synthesized at 200 °C for 120 min. They achieved a responsivity of 290 mA/W, detectivity of 1.8×10^9 Jones, and an external quantum efficiency of 37% with the photodetector.

Another broad area which is well represented in this special issue is *environmental chemistry*, with four featured articles. Avino et al. [4] reported on the weekly and longitudinal elemental variability in hair samples collected from non-occupationally exposed subjects. Neutron activation analysis was used to determine 30 elements in hair samples collected from different locations on the scalp. Notable differences were observed among samples between the proximal and distal sections. A comparison with other studies was used to establish the relationships and the differences caused by different ethnic origins, lifestyles, diets, and climates among different young populations. In another study, Assi

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et al. [5] explored the use of bottom ash derived from the co-combustion of municipal solid waste and sewage sludge as a stabilizing agent. Two other components used in the stabilization method included flue gas desulfurization residues and coal fly ash. Results obtained by leaching test on the stabilized samples revealed that heavy metal concentrations, particularly for Zn and Pb, were significantly reduced. The three factors responsible for the reduction of the heavy metal concentrations by the stabilization method were the amount of ash used, the Zn and Pb concentrations in the as-received fly ash, and the solution of the final materials. Porto et al. [6] investigated the removal of phosphorus from a secondary-treated effluent of a Portuguese paper company based on the growth and ability of *Chlorella vulgaris*. Results obtained by batch experiments revealed that the undiluted effluent inhibited microalgal growth. Consequently, the dilution of the effluent was necessary to achieve the desired bioremediation. The most diluted effluent enabled the removal of 54 $\pm$ 1% of phosphorus. It was also found that the microalgal growth was dependent on the compounds present in the effluent and on the solution pH. In the last featured article on environmental chemistry, Adeloju et al. [7] reviewed the effects and consequences of arsenic contamination of groundwater with regard to drinking water quality and human health in under-developed countries and remote communities. They discussed the chemistry of arsenic and the factors influencing the form(s) of arsenic present and its fate when introduced into the environment. They also provided a global overview of arsenic contamination of groundwater around the world, and a case study of arsenic contamination in Bangladesh was used to highlight the health-related, agricultural, social, and economic impacts. Furthermore, the available strategies for removal of arsenic and specific examples of the available filter systems for domestic arsenic removal from groundwater for potable water use were discussed.

Polymer/coating chemistry also features very well in this special issue, with three articles. Kanellopoulou et al. [8] reported on their investigation of the effect of the incorporation of superabsorbent polymers (SAPs) into cementitious-based composite materials on their microstructure and self-healing properties. It was found that the compressive strength remained intact for all specimens with the incorporation of the SAPs. This was attributed to the reduction in porosity and the narrower range of pore size distribution of the mortar/SAP specimens. In addition, an up to 60% increase in the self-healing behavior of mortar/SAP specimens was observed when compared to control specimens. In another study, Quintana et al. [9] investigated the use of licorice root extracts produced by ultrasound-assisted extraction in combination with chitosan to produce edible coatings for improving the postharvest quality of fruits. The bioactive extracts were applied to strawberry for the evaluation of their physicochemical and microbiological properties. It was found that the addition of the licorice extract to chitosan improved the rheological properties of the coatings, resulting in reduced rigidity. Furthermore, during storage, good-quality parameters were maintained by the strawberry coated with chitosan and licorice extract. In addition, the coated strawberry achieved the best microbiological preservation when compared with controls. A very interesting use of a combination of polymers for oral drug delivery was presented by Mumuni et al. [10]. They evaluated the use of different ratios of mucin-grafted polyethylene glycol-based micro-particles, both in vitro and in vivo, as carriers for the oral delivery of insulin. The insulin-loaded micro-particles were found to display irregular porosity and shape. The achieved insulin encapsulation efficiency and loading capacity values were >82% and 18%, respectively. The variation in the micro-particle formulation resulted in a variation of the insulin release of between 68% and 92%. More significantly, the oral administration of the insulin-loaded micro-particles achieved a more significant reduction in blood glucose levels than the use of insulin solution. Evidently, the results of this study demonstrate that the use of a combination of polymers for oral delivery of insulin is more effective.

Nanomaterial chemistry also features in this special issue, with two articles. Stefa et al. [11] reported on the use of a hydrothermal method for the synthesis of ZnO-doped ceria nanorods made up of CeO_2/ZnO mixed oxides with different Zn/Ce atomic ratios.

The mixed oxides were found to be superior to CeO_2 and ZnO oxides, which was attributed to the synergistic effect of the ZnO–CeO_2 interaction. It was also established that there was a close correlation between the catalytic activity and oxygen storage capacity of the ZnO-doped ceria nanorods. In another study, Sánchez-Romate et al. [12] produced carbon fiber-reinforced plastic bonded joints with novel carbon nanotube (CNT) adhesive films. By varying the surfactant content used to aid the CNT dispersion, they were able to test the carbon fiber-reinforced plastic bonded joints under different aging conditions. It was found that the electrical response, based on the measurement of the electrical resistance, varied with the aging conditions and after 1 month a higher plasticity region was demonstrated. A sharper increase was also found with 2-month-old samples. Notably, by increasing the surfactant content, the observed changes became more prevalent. However, the presence of more prevalent brittle mechanisms for the CNT-doped joints resulted in a higher established first estimation of damage accumulation for non-aged and 2-month-old samples.

In a final paper on *flavonol chemistry*, Rogozinska and Biesaga [13] utilized LC-MS/MS to investigate the stability of four common types of dietary flavonols, namely: kaempferol, quercetin, isorhamnetin, and myricetin, in the presence of hydrogen peroxide and saliva. They also investigated the influence of saliva on the representative quercetin glycosides rutin, quercitrin, hyperoside, and spiraeoside. They found that flavonol stability generally decreased with increasing B-ring substitution, irrespective of the oxidative agent used. Glycosides were in particular found to be resistant to hydrolysis in the presence of saliva. However, it was proven that saliva is an oxidative agent which often results in the formation of corresponding phenolic acids, thus highlighting the need to give this factor due consideration in flavonol metabolism. The fact that flavonol decomposition starts in the oral cavity suggests that it may not be present in the parent form, but as phenolic acids.

These featured invited papers in this Special Issue for "The 10th Anniversary of Applied Sciences" are good examples of the depth and breadth of chemistry articles published in the Chemistry Section of *Applied Sciences*. The section continues to attract increasing numbers of manuscripts relating to all areas of chemistry for publication in the journal.

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