Editorial

Separation of Organic and Inorganic Compounds for Specific Applications

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Received 30 November 2014; Accepted 30 November 2014

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Organic and inorganic compounds deal with the structure, properties, and reactions of compounds. Chemists in general and organic chemists in particular can create new molecules never before proposed which, if carefully designed, may have important properties for the betterment of the human experience. Organic and inorganic compounds play important role in industries such as the rubber, plastics, fuel, pharmaceutical, cosmetics, detergent, coatings, dyestuffs, and agrichemicals industries. The foundations of biochemistry, biotechnology, and medicine are built on organic compounds and their role in life processes. Most of the modern, high-technology materials are composed, at least in part, of organic and inorganic compounds. Clearly, separation of organic and inorganic compounds is critically important to our high standard of living. In this respect, we decided to publish this special issue. We have received many article submissions for this special issue. We selected the best 7 of them for publication. This special issue contains 5 original research papers and 2 review articles.

A study by J.-Y. Liu et al. entitled “Experimental and Modeling Studies on the Prediction of Gas Hydrate Formation” proposed a new prediction model of gas hydrate formation on the base of some kinetics model analysis

and kinetic observation of hydrate formation process. The analysis of the present model shows that the formation of gas hydrate is not only relevant to gas composition and free water content but also relevant to temperature and pressure. Through contrast experiment, the predicted result of the new prediction method of gas hydrate crystallization kinetics is close to measured result; it means that the prediction method can reflect the hydrate crystallization accurately. In actual application, the various parameters should be modified according to the practical situation.

In another study by L. Wang et al. entitled “Synthesis and Preliminary Properties of Novel Poly(aryl ether)s Containing β -Naphthalene Pendant Group,” the authors synthesized two novel poly(aryl ether)s containing β -naphthalene pendant group and the structures of these polymers were determined by using HNMR spectroscopy. These polymers exhibited good thermal stabilities with high Tg of 256°C and 274°C, respectively. They investigated solubility of polymers in common organic solvents, such as DMAc, DMSO, CH₂Cl₂, and CHCl₃ by electrospinning into microfiber (1–5 μ m) with lots of nanopores (<100 nm) from CHCl₃ solution. These fibers showed high hydrophobicity, and the contact angle of fibers is above 120°. As a result of this study, these polymers

had excellent thermal stabilities and good solubility. The fibers with many nanopores were produced by electrospinning, exhibiting high hydrophobicity. The polymers could be potentially used as high temperature materials, waterproof materials, and transport carriers.

Another valuable article entitled “Purification of Anthocyanins with *o*-Dihydroxy Arrangement by Sorption in Cationic Resins Charged with Fe(III)” was published by A. Castañeda-Ovando et al. in this special issue. The authors proposed a new purification method of anthocyanins with *o*-dihydroxy arrangement. This method is based on a ligand-exchange mechanism, using a cationic exchange resin loaded with metallic ions in order to increase the affinity of the resin to the anthocyanin(s) with *o*-dihydroxy arrangement. They used this method to purify the main anthocyanin (cyanidin-3-glucoside; Cy-3-glc) from the anthocyanic methanolic extract of blue corn. The best sorption result was using Fe(III) in its ion form. The purification procedure begins with the formation of a metal-anthocyanin complex (Cy-3-glc-Fe) which was optimal at pH 5, followed by NaOH 0.1 M elution process in order to eliminate anthocyanins without *o*-dihydroxy arrangement, sugars, and organic acids. Finally, the pure anthocyanin is obtained by adding HCl 0.1 M which breaks the metal-anthocyanin complex. The authors proposed Cy-3-glucoside purification method by means of sorption in cationic exchange resin loaded with Fe³⁺. This is shown to be quite viable for *o*-dihydroxy anthocyanins, because (i) it decreases procedure costs, since it is possible to be carried out in less time unlike the chromatographic methods proposed previously, (ii) the percentage of anthocyanin extraction reached is above 99.99%, and (iii) it is possible to collect the main anthocyanin with high purity and analyze it by other spectroscopic techniques.

The paper entitled “Layer-by-Layer Assembly of Polysaccharides and 6,10-Ionene for Separation of Nitrogen-Containing Pharmaceuticals and Their Enantio recognition by Capillary Electrophoresis” by A. Ioutsy et al. investigated preparation of two silica capillaries modified layer by layer with 6,10-ionene and N-(3-sulfo, 3-carboxy)-propionyl chitosan (SCPC) and with 6,10-ionene and dextran sulfate (DS). Dynamic coating of the capillary efficiently reduces the adsorption of the background electrolyte, sample matrix components, and analytes on its inner wall. Such coatings effect good reproducibility and sensitivity of determination. Authors demonstrate that separation of beta blockers, calcium channel blockers, alpha-adrenergic agonists, H1-blockers, and diuretics was most efficient and rapid with a capillary modified with dextran sulfate. Tetrahydrozoline, carbinoxamine, and furacilin, which are commonly employed as treatments for allergic rhinitis, were identified in human urea. Their concentrations, independently verified by HPLC, were found to be 5.3 ± 0.8 , 6.6 ± 0.5 , and $0.9 \pm 0.2 \mu\text{g mL}^{-1}$; LOD = 0.07, 0.03, and $0.10 \mu\text{g mL}^{-1}$ and LOQ = 1.0, 0.8, and $0.6 \mu\text{g mL}^{-1}$, respectively. As a result of this study, the authors reported the optimal conditions for identification and separation of tetrahydrozoline (alpha-adrenergic agonist), carbinoxamine (H1-blocker), and furacilin in human urea. The DS-modified capillaries are

also suitable for separation of other nitrogen-containing compounds and their enantiomers.

The other contribution to this special issue is entitled “Analysis of Antifungal Components in the Galls of *Melaphis chinensis* and Their Effects on Control of Anthracnose Disease of Chinese Cabbage Caused by *Colletotrichum higginsianum*” by P.-C. Kuo et al. (from Taiwan) and it proposed fungal pathogens which caused various diseases which resulted in heavy yield and quality losses on plants of commercial interests such as fruits, vegetables, and flowers. In their preliminary experimental results, the methanol extracts of four species of medicinal plants, *Melaphis chinensis*, *Eugenia caryophyllata*, *Polygonum cuspidatum*, and *Rheum officinale*, possessed antifungal activity to causal agent of cabbage anthracnose, *Colletotrichum higginsianum*. Thus, it was conducted to identify and quantify the chemical constituents in these herbs and to assess the antifungal effects of these compounds. Among the tests, the indicator compound methyl gallate from *M. chinensis* was the most effective against the conidial germination. In addition, it exhibited significant effects of controlling anthracnose disease of Chinese cabbage caused by *C. higginsianum* PA-01 in growth chamber. These results indicate that *M. chinensis* may be of potential for further development of plant-derived pesticides for control of anthracnose of cabbage and other cruciferous crops. The present investigation results indicate that the methanol extracts of *M. chinensis*, *E. caryophyllata*, *P. cuspidatum*, and *R. officinale* may be of potential for further development of plant-derived pesticides for control of anthracnose of cabbage and other cruciferous crops. The developed HPLC analytical methods are convenient and feasible tools for species authentication and quality assessment of the herbal raw materials. It is helpful to monitor the contents of active principles in the herbs for developing new botanical pesticides. According to the experimental data in the present study, methyl gallate showed only 1/80 activity of the pesticide azoxystrobin; however, the herbal extracts would be safer and less dangerous to the ecosystem. These traditional Chinese medicines could be studied further for their cytotoxicity and synergistic effects of different combinations. It would be also potential to study the antifungal mechanism in the future.

A review contribution is from M. Dołowy and A. Pyka with the title “Chromatographic Methods in the Separation of Long-Chain Mono- and Polyunsaturated Fatty Acids.” This review presents various chromatographic systems, TLC, HPLC, GC, and also SFC, developed for identification and accurate quantification of long-chain mono- and polyunsaturated fatty acids from different samples with emphasis on selected literature which was published during last decade. Almost all the aspects such as pre separation step of fatty acids (to *cis*- and *trans*-), stationary phase, solvent system, and detection mode were discussed. This literature review, which is focused on the application of the chromatographic methods such as TLC, HPLC, GC, and also SFC in analysis of mono- and polyunsaturated fatty acids (MUFA and PUFA) in different matrices, shows that all of the presented chromatographic methods are suitable in pre separation and quantification of these compounds. The choice of the chromatographic systems depends on the type of the sample to be analyzed

and on the aim of chromatographic analysis (problem which should be solved by means of this technique). For instant, in order to obtain complete fractionation of “*trans*-/*cis*-” fatty acids from different samples, the traditional Ag-TLC or argentation HPLC (Ag-HPLC) is used. The column chromatography such as GC and HPLC may be used in further steps of chromatographic analysis of unsaturated fatty acids (MUFA and PUFA), especially to determine the quantity of separated fatty acids. In the case of geometrical isomers (*cis*- and *trans*-) and determining of the number and position of double bonds present in studied unsaturated fatty acids, Ag-HPLC and various GC systems are popular. Current literature indicates that the innovations which are implemented into chromatographic systems include modified stationary phases, new derivatizing agents for fatty acids, and also developing of novel detection systems allowing sensitive and reproducible fatty acid analysis from complex samples. Moreover, the new chromatographic systems combined with other instrumental methods such as MS, MS/MS, IR, or two-dimensional GC enable analysis of a large number of MUFA and PUFA in lower quantities, which is required, for example, in food analysis. The results presented in this paper confirm that the chromatographic methods are still a powerful tool in analysis of mono- and polyunsaturated fatty acids.

The last contribution is a review article in this special issue; it is from D. Datta et al., and it is entitled “Status of the Reactive Extraction as a Method of Separation.” This review paper presents a state-of-the-art review on the reactive extraction of carboxylic acids from fermentation broths. This paper principally focuses on reactive extraction that is found to be a capable option to the proper recovery methods. Mechanisms of related secondary, tertiary, and quaternary amines and their reactions with carboxylic acids (mono-, di-, and tri-) were presented. Summary of the modeling experimental data and their kinetic studies has existed.

We sincerely hope that this kind of annual issue series will have a long-term impact and can gather a community around it in a short time in much the same way a successful annual conference does.

Acknowledgments

Firstly, we express our sincere thanks and gratitude to the Editorial Board of Journal of Chemistry for including our special issue as an annual issue. We would also like to thank contributors to this special issue for their scientifically sound research/review articles. With great pleasure and respect, we extend our thanks to the reviewers for critical assessment of each paper, their constructive criticisms, and timely response that made this special issue possible.

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