Journal of Renewable Materials

Tech Science Press

DOI: 10.32604/jrm.2023.044083

EDITORIAL

# Renewable Biomass as a Platform for Preparing Green Chemistry

**Qiaoguang Li[1,*], Puyou Jia[2,*], Ying Luo[3] and Yue Liu[4]**

[1]College of Chemistry and Chemical Engineering, Zhongkai University of Agriculture and Engineering, Guangzhou, 510225, China

[2]Institute of Chemical Industry of Forestry Products, Chinese Academy of Forestry, Nanjing, China

[3]College of Materials and Energy, South China Agricultural University, Guangzhou, 510642, China

[4]College of Chemical Engineering, Qingdao University of Science and Technology, Qingdao, 266061, China

[*]Corresponding Authors: Qiaoguang Li. Email: liqiaoguang8799@163.com; Puyou Jia. Email: jiapuyou@icifp.cn

Received: 01 July 2023 Accepted: 13 July 2023 Published: 11 March 2024

## 1 About the Special Issue Editor

**Qiaoguang Li** is an associate professor and master's supervisor in the Department of College of Chemistry and Chemical Engineering, Zhongkai University of Agriculture and Engineering. He received his PhD from Institute of Chemical Industry of Forestry Products, Chinese Academy of Forestry in 2018. He has been focusing his research on the chemical basis and application of natural resources. He has published nearly 30 international peer reviewed papers and applied for 10 patents. He is now responsible for more than 8 items of research projects competitively granted from natural science foundation of China, Department of education of Guangdong Province and other institutions.

He has received the third prize of Guangdong Provincial Agricultural Technology Promotion Award (first) and appointed as a young editorial board member for the Sustainable Structures journal and guest editor in chief for Journal of Renewable Materials, and Frontiers in Environmental Chemistry journals.

**Puyou Jia** completed Ph.D. in 2016 at the Beijing Forestry University. Then, he joined Institute of Chemical Industry of Forestry Products, Chinese Academy of Forestry (CAF) as an associate professor. Puyou Jia's work broadly concentrates on the chemical transformation and utilization of biomass resources. He has published more than 100 papers on the atom-efficient, ecofriendly, highly efficient chemical transformations of a variety of biomass into sustainable intermediates, polymer auxiliaries, bioplastics, elastomers and advanced bio-based materials.

**Ying Luo**, Associate Professor, College of Materials and Energy, South China Agricultural University, China. Dr. Ying Luo received her doctoral degree of Polymer Chemistry and Physics from Sun Yat-sen University, China, in 2005. Her research interests have been focused on the preparation & functional modification of polymer or bio-based polymer materials, and degradable plastics. She has authored or co-authored more than 30 international peer reviewed papers and 1 book chapters. She has applied 4 patents.

**Yue Liu** is currently an associate professor and master supervisor at the College of Chemical Engineering, Qingdao University of Science and Technology. He received his PhD degree from Qingdao University of Science and Technology in 2017. His research interests include environment-friendly catalysis, fine chemical industry, biomass conversion, core-shell composite materials, and the preparation, modification, characterization and formation mechanism of core-shell catalysts. He has published 23 SCI

papers as the first author or corresponding author. He has presided over one project of Natural Science Foundation of Shandong Province, one project of Open Fund Project of Jiangsu Key Laboratory of Biomass Energy and Material, and three enterprise projects.

## 2 Special Issue Introduction

This, combined with the associated environmental issues around global warming and environmental pollution, has resulted in a drive for scientific research to alleviate the dependence of society on chemical compound/polymer derived from fossil fuels. The biomass (such as cellulose and lignin) of carbohydrates are rich in hydroxyl makes it through the hydrothermal catalytic hydrogenation, dehydration and oxidation etc directly into polyols, lactic acid and 5-HMF important ideal oxygen chemical raw material. Cellulose, sugar, starch, natural fiber and vegetable oil in these renewable resources have been used as green monomers or intermediates for polymer preparation and polymer materials. Moreover, the development and application of these renewable biomass as a platform for preparing of green chemistry will improve their utilization, contribute to the protection of the environment and reduce dependence on petrochemical products. This special issue, which consists of **14 articles, including one review article**, focuses on the latest advances in green chemistry and bio-based polymer materials.

Yuan et al. researched the thermal decomposition process and kinetics behavior of oleuropein from the olive resource. For the first and second thermal decomposition stages, the Kissinger, Friedman, Flynn-Wall-Ozawa, and Coats–Redfern four methods were applied to determine the activation energy ($E = 143.72$ and 247.01 kJ $mol^{-1}$) and Arrhenius preexponential factor ($\ln A = 26.34$ and 42.45 $min^{-1}$), respectively.

Li et al. reported that the regenerative electrochemical system is a microbial electrolytic cell improvement system for methane gas produced by biological carbon sequestration technology using renewable energy sources to provide a voltage environment. The methane production rate of regenerative electrochemical system is increased by 2 times and the start-up time is reduced to 10 days. This study can obtain a theoretical basis and technical reference for the early industrial application of microbial $CO_2$ methanation technology based on renewable energy.

Fu et al. studied the overall safety assessment of eucommia ulmoides leaf extract (ELE) was performed, including genotoxicity and long-term toxicity. Plasma triglycerides and low-density lipoprotein cholesterol levels significantly decreased, and plasma high-density lipoprotein cholesterol levels significantly increased with ELE treatment. Not only ELE did not cause genotoxicity, but it possessed good bioactivities and health-promoting. Therefore, we affirmed ELE is safe to consume as a traditional Chinese health food.

Lai et al. successfully synthesized copper nanoparticles in Masson's Pine as a preservative process for sawn timber by situ generation. The results showed that the samples treated by heating without copper salt treatment showed poor suppression of fungal growth, the copper-impregnated heat-treated wood suppressed (100%) the growth of Botryodiplodia theobromae Pat., Aspergillus niger V. Tiegh., Penicillium citrinum Thom, and Trichoderma viride Pers. This study has demonstrated an effective method of increasing low-grade wood's utility and commercial value.

Wang et al. fabricated cationic lignin hydrogels for dye adsorption. The maximum Congo red removal efficiency was obtained at the initial concentration of Congo red of 50 mg/L, pH 7, and 5 mg dosage of cationic lignin hydrogel with 20% cationic lignin content. After five cycles of adsorption, the adsorption efficiency of the hydrogel for Congo red still reached more than 80%. These results demonstrate the potential of the CKLA hydrogel as an adsorbent for water treatment.

Yan et al. prepared of vegetable-oil-based thioether polyol and ethyl cellulose supramolecular composite films. Pure ethyl cellulose is fragile, and the addition of Ethyl cellulose makes the ethyl cellulose films more flexible. The application of bio-based material is environmentally friendly, and the novel DATP can be used as a special and effective plasticizer to prepare flexible ethyl cellulose films.

Chu et al. studied phosphorus containing rubber seed oil as a flame retardant plasticizer for polyvinyl chloride via epoxidation reaction and ring opening addition reactions. When Dioctyl Phthalate was replaced with flame-retardant rubber seed oil-based plasticize, the torque of PVC blends increased from 11.4 to 18.4 N·m, the LOI value increased from 24.3% for PVC-FRP-0% to 33.1% for PVC-FRP-20, suggesting a new way to prepare flame retardant plasticizer using rubber seed oil as raw material.

Zhao et al. reviewed research progress of tung oil/ultraviolet photocomposite curing material. Firstly, the chemical structure and application of tung oil and ultraviolet Photocatalysis Technology were briefly introduced. Secondly, the research status of novel tung oil/ultraviolet photo-composite curing materials developed by the Diels-Alder reaction was discussed. Finally, the research and application prospects of TO/UV photo-composite curing materials were presented.

Yao et al. specially designed and synthesized a tung oil-based boron-nitrogen coordination polymer (TWE-BN) as a highly efficient water-based lubricant additive for investigating its hydrolysis stability and tribological properties. TWE-BN was better than nitrogen-free tung oil-based lubricant additive and remained non-hydrolyzed for at least 15 days, implying the feasibility of tung oil-based boron-nitrogen coordination as highly effective and hydrolytic stability lubricant additives.

Tang et al. used rosin and choline as raw materials to prepare a bio-based $CO_2$ responsive surfactant rosin acid dimaleimide choline (R-BMI-C) with an extremely rigid skeleton by Diels-Alder addition reaction and acid-base neutralization reactions. The internal aggregation structure of R-BMI-C aqueous solution changed from spherical micelles to laminar micelles.

Wang et al. researched the promoting effect of multifunctional groups on the thermal and mechanical properties of PVC Materials. Myrcene with double bonds, amino groups, ester groups, and phospholipid groups was introduced into the chains of PVC to improve the thermal stability of PVC. The double bonds trapped the unstable chlorine atoms originated from the degradation of the PVC chain and reacted with the labile macromolecular radicals originated from PVC, thus inhibiting the radical degradation of the PVC chain. Furthermore, the amino groups absorbed the HCl produced in the degradation of PVC, inhibiting the adverse effects of HCl.

Chang et al. synthesised the antioxidant activity of (E) ω-formylcamphene-based thiazole hydrazone derivatives. The results show that 14 (E) ω-formylcamphene-based thiazole hydrazone compounds exhibited good scavenging effects on the two free radicals, especially when the concentration of the drug solution was 125 and 62.5 mg/L; most compounds exceeded the scavenging efficiency of Trolox and L-ascorbic acid.

Huang et al. successfully prepared fosthiazate-stearic acid/expanded perlite sustained-release particles by vacuum impregnation using expanded perlite (EP) as carrier, fosthiazate (FOS) as model pesticide and stearic acid (SA) as hydrophobic matrix. With the mass ratios of FOS to SA decreasing from 7:3 to 3:7, the 24 h release rate of FOS-SA/EP decreased from 18.77% to 8.05%, and the drug loading decreased from 461.32 to 130.99 mg/g.

Wang et al. assessed their effects on $H_2O_2$-induced oxidative damage model of human umbilical vein endothelial cell (HUVEC) by selecting four characteristic components (chlorogenic acid, geniposidic acid, aucubin, quercetin). Cell cycle, cell apoptosis, cell senescence, and their related proteins under characteristic components treatment exhibited a better effect than under $H_2O_2$ treatment, implying the characteristic components could participate in anti-aging via multiple pathways.

In summary, green chemistry and bio-based polymer materials made from various renewable feedstocks represent one of the most promising directions due to their sustainability. These field have attracted extensive attention and achieved significant progress during the past few decades. The field of green chemistry and bio-based polymer materials is experiencing rapid growth, which should continue for the coming decade.

**Acknowledgement:** This special issue would not have been come out without the authors' insightful contributions and reviewers' professional work, which we gratefully acknowledge for the wonderful and productive relationship we had. We would also like to express our gratitude to the editorial team of Journal of Renewable Materials for all of their assistance and support.

**Funding Statement:** This work was supported by the National Natural Science Foundation of China (Grant No. 32101475), Scarce and Quality Economic Forest Engineering Technology Research Center (Grant No. 2022GCZX002) and the Key Lab. of Biomass Energy and Material, Jiangsu Province (Grant No. JSBEM-S-202305).

**Author Contributions:** All authors contributed equally to this work. The manuscript was written through the contributions of all authors. All authors have given approval to the final version of the manuscript.

**Availability of Data and Materials:** Not applicable.

**Conflicts of Interest:** The authors declare that they have no conflicts of interest to report regarding the present study.