

Sustainable polymers: Waste- and bio-feedstocks are goldmines for innovative applications

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Depleting fossil fuel reserves and increasing waste reservoirs are among the world's most pressing problems. This calls for exploring naturally occurring building blocks for developing bio-based polymers. Polybenzoxazine is a new class of thermally curable thermosets being pitched as superior alternates of phenolics. In this work, I intend to exploit the options of synthesizing partially bio-based polybenzoxazines following green chemical principles of atom economy, bio-renewable feedstock, solventless synthesis, and nontoxic waste generation. In addition, the molecular flexibility of benzoxazine moiety has been utilized by studying the relation between higher functionality and properties. These polymers have shown improved thermal stability compared to their non-green counterparts and the ability to copolymerize with elemental sulfur as one of the high-tonnage industrial wastes, thus finding wide applicability [1-5] from adhesive, antibacterial, water purification materials to cathodes for next-generation beyond Lithium-ion battery (LIB) and self-healing materials.

References

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BIO

Bimlesh Lochab (Department of Chemistry, Professor & Head, FRSC) did M.Sc. (Chemistry), M.Tech. (Polymer Science and Technology) from IIT, Delhi, India and D. Phil. (Chemistry) from the University of Oxford, UK. BL was post-doctoral fellow and lecturer (retained) at the University of Oxford, and followed by PDF at University of Nottingham, UK. Recipient of several awards, the first Most Creative Research Award@Luxembourg Institute of science & Technology, Research Excellence Award@ Shiv Nadar University, CRSI Bronze award, APA Young Scientist Award, BIRAC-SRISTI GYTI (Gandhian Young Technological Innovation) award, Young Scientist Award (DST), Distinguished alumna award. BL invited to give a commentary on work by the promise of Green Chemistry by Hon. Mike Lancaster in Investigating Pathways to Resolve Environmental Challenges, ICUS XXVIII, the Unity of Sciences. BL is selected as 75 Women in SHE IS - 75 WOMEN IN CHEMISTRY featured in the fourth edition of She Is, by Beyond Black in partnership with the Office of the Principal Scientific Adviser, GoI and RSC. Received several invitation requests for media coverage as an expert in the sustainable chemistry for national television by DST, YouTube, DD News, Newspapers etc. BL presided several sessions in ACS conference and gave several plenary and keynote lectures. BL is an invited Fellow of Royal Science of Chemistry (FRSC), Fellowship from C. R. Barber Trust Fund (IoP, UK), Felix Scholarship (UK), Council of Scientific and Industrial Research–Junior Research Fellowship, and Radha Sai Ram Memorial prize. Membership of ACS, APA, CRSI and the Society for Polymer Science (India) SPS (Lifetime), Member of Institute of Physics and Polymer Physics group, UK. BL is Chief Executive member of Sustainability Forum and National Advisory Committee Member in APA, and EC member for the Society of Polymer Science, India (SPSI). BL worked on 12 research grants (out of which 1 is with GE industry, 1 International grant Canada and 2 are ongoing). BL (h-index = 29, i10-index = 46) has published 78 (ACS, RSC, Wiley, Springer, Elsevier, etc.) articles, 10 patents, 1 book and 6 book chapters, on the renewable waste-derived sourced materials and their exploration to multitude of applications (energy storage, adhesives, drug delivery, antibacterial) using the tenets of Green Chemistry.