Title:	Design and synthesis of biomass-derived nanocomposites for catalytic Applications
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Abstract:	In the current scenario, new materials from bio-renewable and sustainable sources are being developed to tackle the increasing environmental concerns such as waste accumulation, diseases, energy, and the inevitable depletion of fossil fuels. In the development of innovative methods and materials, composites offer substantial advantages being the most promising green materials of modern times due to their excellent properties such as ease of fabrication, renewability, biocompatibility, abundance, and high thermal stability, etc. However, due to insufficient knowledge in chemo processing or the unavailability of required instrumentation, biomass degradation has not been exploited to its full potential to generate efficient and renewable materials. Therefore, now the scientific community focuses on unravelling the potential of biomass to generate biomass-based metal oxide nanoparticles or carbon-rich nanomaterials (e.g. carbon dots (CDs)) for various applications, such as catalysis, clean-up of the environment, and value-added chemicals, etc. Herein, we envisaged that biomass could be utilized towards functional group transformations, low-cost synthetic route for expensive drug, and synthesis of value-added products by using newly designed chemo-processing methods (CPM) (Figure 1). The CPM utilizes the inherent energy of biomass for the synthesis of metal oxide nanoparticles using suitable organic functionalization and metal salts. Hence, through the chemo-processing method, the abundant cellulose with thiol-modification was used to generate highly reactive copper-oxide (CuI/IIO) NPs based low-cost catalyst suitable for azide-alkyne cycloaddition (CuAAC) and the Glaser and cross-Glaser-coupling reactions. The hetero-selectivity of dialkynes products through a novel polarity based approach have been demonstrated. In addition, the newly designed catalyst has been utilized in the industrial environmental-friendly synthesis of rufinamide drug intermediate to bring down the cost of the costly anti-epileptic drug “Rufinamide”. Further, in an entirely different degradation approach, we have also synthesized the nanohybrid catalyst of Pd NPs decorated with the biomass-derived carbon dots (CDs) polymer for the sonocatalytic degradation of industrial organic waste. Finally, we have shown for the first time that fully-sulphonated carbon dots can be achieved from simple bench-top chemicals (i.e., PTSA) rather than the conventional sulphur acid treatment approach. The Bronsted-acidfunctionalized solid-acid carbon nanoparticles have been studied for their catalytic efficacy towards converting biomass to value-added chemicals. Figure 1. Schematic representation of the synthesis of newly designed nanocomposites from bio-mass via chemo-processing and degradation methods for organic transformations, environmental remediation, and bio-fuel production.
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