Wood Waste-Derived Renewable Energy Storage Materials

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The conversion of waste into high-value functional materials is important because of the sustainable chemistry, valorization of waste, and replacement of fossil fuel-derived counterparts. However, existing synthetic methods are hindered by difficulties about fine tuning of their physical and chemical properties of heterogeneous source. In this talk, I will introduce two chemical strategies into valorization of wood waste for energy storage applications: (1) A straightforward separation-free valorization of lignocellulose into heteroatom-doped and undoped carbon dots (CDs) and nanoporous carbons (CNs) will be addressed. In particular, the high quality of the functionalized CDs and CNs is massively produced. Their optical and electrochemical properties are further improved by in-situ incorporation of heteroatoms during a hydrothermal process. (2) We also demonstrate the pseudocapacitive lignin nanocrystals confined on conductive carbon nanostructure for renewable energy-storage materials. The excellent capacitive characteristics of the renewable electrodes were achieved by synergizing the reversible redox charge transfer of quinone and the interplay with carbon architecture.