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Biomass and Waste Conversion and Valorization to Chemicals, Energy and Fuels

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Biomass and biowaste are a storehouse of a wide variety of valuable compounds, and their conversion to energy and bioproducts, platform chemicals, biofuels, etc., offer a multifaceted approach to addressing some of the most pressing global challenges, including climate change, waste management, and sustainable development.

Efficient and viable biomass valorization, however, requires the introduction of innovative advanced techniques and processes with limited applications of conventional organic solvents. Techniques using green pressurized fluids as solvents and processes like chemical catalysis, biochemical and thermochemical conversion, enzymatic hydrolysis, fermentation, anaerobic digestion, etc. can transform the biomass into bioactive compounds, bio-oils, and other valuable products. The latter can subsequently be used for the production of pharmaceuticals, food additives and supplements, platform chemicals, biofuels, or materials like biochar, which can find applications as a soil amendment or as a carbon sequestration tool.

Embracing such technologies epitomizes the new synergistic approach for the development of holistic zero-waste biorefineries, which are at the nexus between sustainability and circular bioeconomics and will not only reduce environmental impact but also pave the way to a cleaner and more economically resilient future.

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