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# Conversion of Biomass and Waste to Value-add Products: Challenges and Opportunities

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## Abstract

Biomass either terrestrial or marine biomasses are essential source of renewable energy in terms of syn-gas production or extraction of valuable chemicals. Nowadays, energy crisis is a major problem not only in India, but all across the world due to shortage of conventional fuels. Researchers, today mostly focus on efficient way of utilization of bio energy for thermo chemical conversions such as pyrolysis, gasification, liquefaction, carbonization and combustion. These methods are promising technology in the recent times for its low carbon footprint and less carbon dioxide emission. While in case of conventional energy source caused several problems due to high emission of greenhouse gases. So the current trend is to find out alternate energy source and is simultaneously to investigate different pathways for reduction of pollution level in the atmosphere. For this to meet the energy consumption, although addressing the importance of energy security and environmental impact has grown interest in the alternate fuels instead of fossil fuels. Biomass is one of the solutions to meet the above challenges due to its carbon neutral energy sources and huge available around the world. newlineSo thermochemical conversions can be more fruitful to convert solid fuel to convenient gaseous form or liquid form in the downstream process. Direct combustion of biomass produces NOx, SOx from fuel-bound nitrogen and sulphur. Gasification provides the opportunity to control the level of gaseous and particulate emission, which is leading to lower down concentration particulate matters, soot particles, NOx, SOx, and the production of clean energy or valuable chemicals (e.g., CO, H2, or CH4). Much of the mass degraded during biomass decomposition at lower pyrolysis temperatures. Again, steamgasification or gasification offers thermal treatment at elevated temperature under a reducing atmosphere that leads to fuelbound nitrogen and sulphur formed into N2 or H2S or any other gases can be removed by absorption beds. By this way the fuel hydrog

#### Keywords

Environmental profile, life cycle assessment, oligosaccharides, prebiotics, residual lignocelluloses sources

#### Introduction:

Today, energy crisis and environmental issues are two paramount problems confronting the world. Energy and environment are integral part of our daily life. The consequence of energy crisis triggers monumental problems in environment related areas especially from burning of conventional sources of energy. Nonetheless, the mankind is still substantially relying on the conventional sources of energy such as coal, oil and natural gas. The formation of conventional sources of energy such as fossil fuels in the earth entails thousands of years and their reserves are finite. In spite of these fossil fuel constraints, the rate of depletion of these fuels is extremely faster (about 100,000 times faster) than their formation [1]. The conventional energies are largely hinged on coal, oil and natural gas. The present civilization consumes the conventional energies rapidly and voraciously as compared to last few decades. So, naturally it can be predicted that the whole mankind in the universe might pass through relentlessly huge energy crisis in the ensuing future.

# **Global Energy Scenario**

The World Energy Council (WEC) has developed two possible scenarios modelled by characteristics, which, from their own perspective, may completely envelope the large part of the world in 2050 - these are Jazz scenario and Symphony scenario. Although scenarios are imagined with music, they are completely different in nature. Jazz has a focus on energy equity with priority given to achieving individual access and affordability of energy through economic growth and Symphony has a focus on achieving environmental sustainability through internationally coordinated policies and practices [7]. The WEC primarily estimated the total primary energy supply (equivalent to consumption) which is bound to increase globally from 545 EJ in 2010 to 878 EJ in the Jazz scenario and 696 EJ in the Symphony scenario in 2050. From 1990 to 2010 - this is approximately half the time period covered in this scenario study - total global primary energy consumption rose by roughly 45%. Pyrolysis

Pyrolysis is a kind of thermo-chemical conversion process, similar to gasification, the difference being that pyrolysis occurs in absence of oxygen at temperatures of around 300 -600°C depending on chemical composition of feedstock. The product yield is also different from gasification. The major components of gasification process is syn-gas, while in pyrolysis process three major products are generated viz. biochar, bio-oil and syn-gas which are quantitatively less compared to the syn-gas produced in gasification. The products yield of pyrolysis process is dependent on some factors such as residence time, type of reactors used, particle size and process conditions. Accordingly, pyrolysis can be classified into slow, medium, fast and flash pyrolysis and the products yield is also indicated. Depending upon the objective of usage, type of pyrolysis can be chosen in terms of getting the final products. Slow pyrolysis provides almost equal products of bio-oil, biochar and gas. The gas is mainly consisting of hydrogen and carbon monoxide.

## Conclusion

After studying the overview of energy scenario both in India and World, it was found that the most difficult situation will come in near future as an energy crisis all over the world.

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Renewable energy sources will become an important factor during this crisis time in near future. Nonetheless, researchers or scientists are vigorously working on renewable energy in order towards sustainability. Solar energy is now widely used renewable energy followed by bio-energy and wind energy around the globe. But, still the efficient way of utilization of energy from different technologies is an area of concern. In this background, thermo-chemical conversion processes of biomass e.g. gasification, pyrolysis and steam gasification plays a vital role regarding harnessing energy from biomass efficiently.