



## Gasification of biomass

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Gasification is a process that converts biomass- or fossil fuel-based carbonaceous materials into gases, including as the largest fractions: nitrogen (N<sub>2</sub>), carbon monoxide (CO), hydrogen (H<sub>2</sub>), and carbon dioxide (CO<sub>2</sub>). This is achieved by reacting the feedstock material at high temperatures (typically >700 °C), without combustion, via controlling the amount of oxygen and/or steam present in the reaction. The resulting gas mixture is called syngas (from synthesis gas) or producer gas and is itself a fuel due to the flammability of the H<sub>2</sub> and CO of which the gas is largely composed. Electricity can be derived from the subsequent combustion of the resultant gas, and is considered to be a source of renewable energy if the gasified compounds were obtained from renewable biomass feedstock.<sup>1</sup>

An advantage of gasification is that syngas can be more efficient than direct combustion of the original feedstock material because it can be combusted at higher temperatures so that the thermodynamic upper limit to the efficiency defined by Carnot's rule is higher. Syngas may also be used as the hydrogen source in fuel cells, however the syngas produced by most gasification systems requires additional processing and reforming to remove the contaminants and other gases such as CO and CO<sub>2</sub> to be suitable for low-temperature fuel cell use, but high-temperature solid oxide fuel cells are capable of directly accepting mixtures of H<sub>2</sub>, CO, CO<sub>2</sub>, steam, and methane.

Syngas is most commonly burned directly in gas engines, used to produce methanol and hydrogen, or converted via the Fischer–Tropsch process into synthetic fuel. For some materials gasification can be an alternative to landfilling and incineration, resulting in lowered emissions of atmospheric pollutants such as methane and particulates. Some gasification processes aim at refining out corrosive ash elements such as chloride and potassium, allowing clean gas production from otherwise problematic feedstock material. Gasification of fossil fuels is currently widely used on industrial scales to generate electricity. Gasification can generate lower amounts of some pollutants as SO<sub>x</sub> and NO<sub>x</sub> than combustion.

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<sup>1</sup> Wikipedia