

# Hydrogen from Biomass

Wet wastes and biomass have not been regarded as promising feedstocks for conventional thermochemical conversion processes because of the high cost associated with drying the material prior to entering the reactor. In the 1990s, the Hawaii Natural Energy Institute (HNEI) developed a process for hydrogen production by the catalytic gasification of biomass in supercritical water (water at high temperature and pressure). This "steam reforming" process produces a gas at high pressure (>22 MPa) that is unusually rich in hydrogen. The results of this work, conducted in the [Renewable Resources Research Laboratory](#) [1] between 1990 and 2001, are summarized in a series of peer-reviewed publications ([Gasification of Biomass in Supercritical Water](#) [2]).

More recent efforts are focused on the thermochemical gasification of biomass in a reactor. This work has been conducted in the [Biomass and Fuels Processing Laboratory](#) [3]. Operating at elevated temperature, the gasification process converts the solid biomass into a gas, while maximizing the chemical energy content of the product fuel gas. Previous work has shown that the hydrogen yield from biomass gasification is most sensitive to the reactor temperature and equivalence ratio, both of which depend upon the relative amounts of fuel and oxygen used in the reactor. The hydrogen content of producer gas can be increased by steam reforming methane and higher hydrocarbon species present from the gasification process.

The product gas from the gasification process can be (1) combusted for heat or power generation; (2) processed further via the water-shift reaction to maximize hydrogen production, as mentioned above; or (3) upgraded and utilized as a synthesis gas to produce more easily transported fuels such as ethanol, methanol, or DME. If used in fuel cells, trace contaminants in the product gas must be removed from the gas stream.

HNEI is working on an experimental program focused on gas upgrading and purification for fuel cell applications. HNEI is also pursuing efforts with a number of industrial partners to explore the low-cost production of hydrogen from cellulosic biomass. Part of HNEI's contribution to this research is in the areas of preprocessing biomass for improved reactor performance and product gas cleanup and conditioning.

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Tags: [hydrogen](#) [4]

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## Links:

[1] <http://www.hnei.hawaii.edu/facilities/r3lab>

[2] <http://www.hnei.hawaii.edu/research/hydrogen/hydro-gas>

[3] <http://www.hnei.hawaii.edu/facilities/epandclab>

[4] <http://www.hnei.hawaii.edu/term/hydrogen>