UNIVERSITY OF WYOMING
Wyoming Technology Transfer and Research Products Center

Biological Catalyst for Water-Gas Shift Reaction

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Patent Status:
Patent Pending

Description of Technology

Some bacteria consume carbon monoxide (CO) as a source of energy and carbon. In order for the bacteria to get the CO into a usable form it does a Water-Gas Shift Reaction (WGSR). This converts the CO into carbon dioxide (CO_2) and hydrogen (H_2) which the bacteria can then consume. Using microorganisms as a catalyst for WGSR is a method used in industry as a way to generate H_2; however, previously, this method has had two problems. First, the bacteria consumed both products of the WGSR, and second, the bacteria would only use CO in a WGSR when no other source of carbon was available and if any other carbon source was present, the WGSR would stop.

Researchers from the University of Wyoming have found a way to stop these problems by genetically engineering the bacteria in two ways to perform a WGSR without consuming the H_2. They have also found a way to significantly lower or eliminate the lag time between exposing the bacteria to CO and when the WGSR starts. The first genetic modification was to delete the hydrogenase. Doing this prevents the bacteria from consuming the H_2 product. The second modification was to overexpress the transcription factor that regulates expression of the genes necessary for CO metabolism and WGSR.

Applications

The invention could be used as a catalyst for WGSR. The WGSR can be used to provide H_2 to a fuel cell or remove CO from a fuel cell so it doesn't get poisoned by the CO. It can also be used as a bioreactor on industrial waste.

Features & Benefits

- Generates H_2 without consuming it
- Lowers or even eliminates the lag time between exposing the bacteria to CO and when the WGSR starts
- Will remove CO to parts per million (ppm) or even parts per billion (ppb)

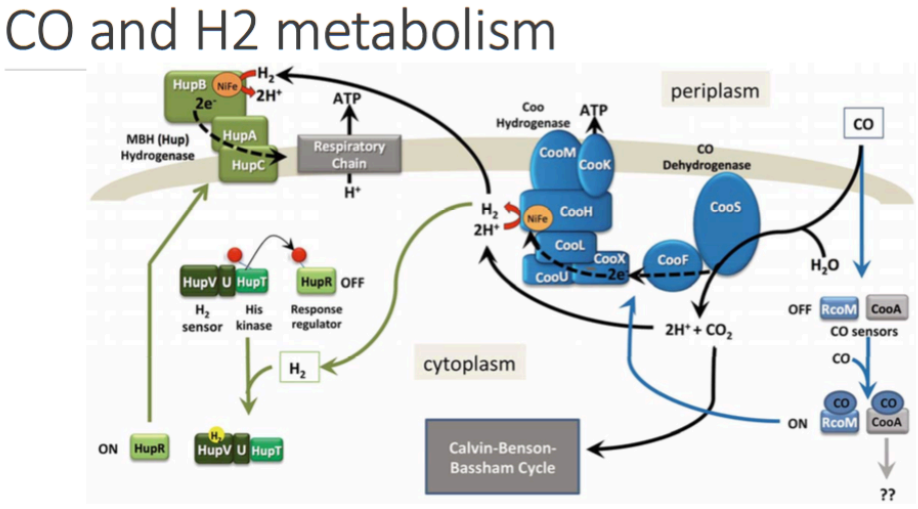

Image from Wawrousek et al. 2014

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