Biological Carbon Monoxide Conversion using Granular Anaerobic Sludge Bacteria

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ABSTRACT

Carbon monoxide (CO) is a major air pollutant and is generated mostly by incomplete combustion of fossil fuels from stationary and mobile transportation sources. For e.g. while the CO content in blast furnace gas is up to 25% v/v, automobile exhaust gas may contain CO in the range 0.5-12% v/v. It occurs in the troposphere at a concentration of 0.1 ppm and in polluted urban areas its concentration has been reported to reach 50-100 ppm. It is a colourless, odourless and tasteless gas with a density slightly lower than that of air. Although known to be produced in low quantities during normal animal metabolism, it is toxic to humans and animals when encountered at a high concentration. Further, in the atmosphere, it plays an indirect role in greenhouse warming by contributing to ground level ozone formation. In this study, the inherent ability of granular anaerobic sludge bacteria (GASB) from three different upflow anaerobic sludge blanket (UASB) reactor treating industrial wastewater to utilize CO as the sole carbon source was examined. These different GASB were initially screened for their ability to utilize CO at pH 7 and temperature 35^{o}C. The results revealed that these bacteria were well capable of converting CO to methane and carbon dioxide as the main products. However, only GASB from UASB reactor treating (Sewage Treatment Plant, Kavoor (43MLD), mangalore, Jakkur and K.R. Puram plant, Bangalore (10MLD each) industry wastewater was able to convert CO with a maximum efficiency of 100 %. Further, two among the GASB produced hydrogen in small quantity compared to methane and carbon dioxide. Hence, such carboxydotrophic bacteria are not only attractive for overcoming CO pollution in the atmosphere but also for cost effective production of biohydrogen. For a better application potential of these CO converting microorganisms, further research aimed at elucidating the CO conversion pathway and studying the effect of various parameters on the process efficiency is currently underway.

***Keywords*:** Carbon monoxide conversion, granular anaerobic sludge bacteria, biohydrogen production, air pollution treatment, carboxydotrophic bacteria.