Fermentation of Xylose and Glucose into Acetic Acid by Moorella thermoacetica
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There has been a lot of interest in fermentation processes utilizing monomeric sugars in lignocellulosic biomass to acetic acid product: a key precursor for many industrial applications such as the production of jet fuel. The selected microorganism for this study is Moorella thermoacetica (Clostridium thermoaceticum). This strain is a thermophilic obligate anaerobe and can homoferment glucose and xylose to acetic acid using CO$_2$ as an electron acceptor at temperatures between 55-60°C and pH 6.5-6.8. This study investigates the production of acetic acid by this homoacetogen from a 1:1 mixture of glucose and xylose, the two major monomeric sugars in lignocellulosic biomass. The research is a necessary step to further study of fermenting a sugar model of lignocellulosic hydrolysates and hydrolysates. Additionally it facilitates application of Raman spectroscopy as quantitative measurements in real-time during fermentation. This is unlike the traditional way of using High performance liquid chromatography (HPLC) which is used in this study. Compared with current analytical techniques, Raman Spectroscopy (RS) allows analytes in samples to be measured simultaneously. Utilization of xylose and glucose as the main sugars for producing lignocellulosic acetic acid proves useful as a foundation for building industrial applications such as jet fuel through bioconversion of lignocellulosic biomass.