Optimization of Anaerobic Biogas Production and Dry Reforming of Biogas for Cleaner Gas Production

PI: Belal Jum'Ah Abu Tarboush

Department of Chemical and Petroleum Engineering

American University of Beirut

Optimization of Anaerobic Biogas Production and Dry Reforming of Biogas for Cleaner Gas Production

The solid waste disposal in the world is a major problem due to the problems associated with landfill areas and the harmful effect of these on the environment and water resources. The objective of this project is to optimize the production of biogas production through the anaerobic digestion process through pretreatment and addition of stimulus additives. Additional objective is to apply dry reforming to convert biogas generated from anaerobic digestion of organic waste with CO2, to produce cleaner fuel such as hydrogen. This is considered as a waste management technique that can deal with organic domestic waste, agricultural waste and sludge from waste water treatment plants. At the same time, this method makes use of CO2 emissions to help convert organic solid waste into energy. This process will be carried out using heterogeneous catalysis employing Nobel metals in order to lower the operating temperatures and minimize energy consumption. It is also known that the biogas from organic waste contains sulfur in the form of H2S that needs to be treated. Thus, the developed catalysts will be also used to desulfurize the produced syngas. The purpose of this work is to produce a synthesis gas which is composed of hydrogen and carbon monoxide through the dry reforming of biogas generated from anaerobic digestion of waste. This will be carried out in a fixed bed reactor using locally developed catalysts. The prepared catalysts will be characterized in terms of surface area, pore size, deactivation and regeneration, and thermal stability. A number of techniques will be used to characterize these catalysts such as X-ray diffraction, electron microscope, BET analysis and FTIR. A variety of operating conditions will be investigated such as temperature, inlet gas composition, catalyst particle size distribution, catalyst loading and process pressure.