Application 2065

Performance and characterization of two activated carbons fo DMS and COS removal

Nicolás de Arespacochaga

CETaqua, Water Technology Center, Barcelona, Spain

One of the solutions that could contribute to decrease dependence from fossil fuels is represented by the exploitation of fuels from biomass through anaerobic digestion. The use of this renewable source determines a very low environmental impact but the resulting biogas is generally poor in energy content. For this reason, biogas can be exploited using a high efficiency conversion system, such as high temperature fuel cells, enhanced in a micro-cogeneration plant.

Unfortunately, sulphur compounds, halogenated hydrocarbons and siloxanes can often be found in biogas. The main sulphur compounds present in biogas are hydrogen sulphide H2S (100-1000 ppm), mercaptanes (0-100 ppm) and traces of COS, CS2 and SO2. H2S represents one of the most harmful compounds for environment and working equipment. In fuel cells applications, H2S poisons both the reformer and the electrodes catalysts of the fuel cell, reacting with nickel; consequently, the biogas should be purified and H2S fraction reduced down to the tolerance limit (< 1 ppm) to allow its safe use. There are many clean up technologies to reduce sulphur levels, but not all can reach ultra-low sulphur for fuel cell applications.

In this project, sulphur removal through adsorption systems is studied: the behaviour and adsorption capacity of selected adsorbent materials are investigated for DMS and COS removal.

The project can be divided in three different tasks:

1) DMS and COS removal:

- Biogas matrix
- S-compounds conentrations = few ppm
- Temperature = 0÷350°
- Pressure = atm
- Relative Humidity = 0÷100%
- Other

2) Characterization of the raw materials

- N2 isotherms: determination of BET surface, pore distribution and pores volume)
- Thermogravimetry
- Scanning Electron Microscopy

- Energy-Dispersive X-ray spectroscopy

3) Characterization of the used materials

- N2 isotherms: determination of BET surface, pore distribution and pores volume)
- Thermogravimetry
- Scanning Electron Microscopy
- Energy-Dispersive X-ray spectroscopy

Activity scheduling:

Experimental activities will start on May 2014, with a duration of six months. Several adsorpiton materials will be dinamically tested, using as feedstock a nitrogen current contamined with COS and/or DMS. All adsorbent samples will be chemically and phisically characterized before and after test.