

## Development and application of hybrid membranes for the enrichment of hydrogen gas produced in biodigesters

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### ABSTRACT

The production of renewable energies is an important topic in our present-day society. Many researchers are currently working in processes for the production of biofuels and also the use of them. Among biofuels the production of hydrogen and methane from different wastes play an important role today. Normally biohydrogen and methane biogas are produced in anaerobic biodigesters using different organic wastes. Nevertheless the produced gas in both cases has undesirable gases like carbon dioxide and sulphur compounds among others. Then it is necessary to decrease the concentration of undesirable gases and at the same time to increase the quantity of hydrogen and methane gas.

Taking into account the aforementioned, our research group has made an extensive work for the development of some hybrid membranes to separate the hydrogen and methane from carbon dioxide and in general from undesirable gases. The hybrid membranes were prepared using colloidal silica by the sol-gel process and polyvinyl acetate, PVAc. The membranes were characterized by Thermogravimetric Analysis, Optical Microscopy, Scanning Electron Microscopy and Raman Spectroscopy. Also mechanical tests like tensile strength, penetration and superficial hardness were performed on the hybrid material used for the production of the membranes.

A homemade device was fabricated for testing the diffusion of gases through the membranes. It was demonstrated that the best performance of the membranes was attained using a ratio silica/PVAc of 35/65 %w/w, methanol as solvent and annealed at room temperature. From the results it was fabricated a device of three columns of 6" for using it in a biodigester prototype of 7.0 tons that will be used for the production of hydrogen and methane.

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**Keywords:** Biohydrogen, membranes, sol-gel.

