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PURIFICATION OF RAW BIOGAS BY SUPPORTED LIQUID MEMBRANES

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Recently we have proposed a new method of membrane separation, using a so-called "condensing-liquid membrane" [1]. This type of membrane has a significant advantage over the usual liquid membrane. Unwanted and toxic gases are removed from its continuously refreshed surface with condensed water to avoid contamination of the perm-selective membrane; furthermore, condensed water passing through the membrane ensures selectivity of the whole separation. The method is in fact based on a liquid (water in this case), condensing on a hydrophilic membrane as a result of the temperature difference of the membrane and the water-saturated biogas feed. The feed gas mixture is saturated by water vapor. The membrane has to be cool enough to make the liquid condense on the surface. Another type of membrane based on a similar principle is the swollen hydrophilic thin film composite membrane. The condensing water on the membrane or on the swollen hydrophilic thin film composite membrane creates a separation barrier, which separates polar gasses (CO_2, H_2S) and CH_4 from biogas on the basis of their higher solubility in water [2]. In order to achieve spontaneous condensation of water, the membrane temperature must be below the dew point of the biogas feed. The contact of the membrane surface with water causes swelling of the polyamide thin film in the case of composite membranes. The raw biogas from sewage plant was used to see the performance of the membrane treated by the new method. The upstream pressure was kept at 500kPa to achieve the highest possible permeation flux (within apparatus limits). At a pressure difference of 400kPa on the reverse osmosis membrane (a swollen skin layer on a dry support) is possible to obtain from raw biogas even more than 95 vol. % of CH_4 in retentate stream.

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References:

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