Electrochemical Synthesis of ZIF-8 Membranes for Propane-propylene Separation

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Identifying alternatives to fractional distillation is an area of heavy research, as distillation towers are too costly and energy inefficient. Membranes, such as ZIF-8, are an effective alternative due to their specific pore sizes which can separate gases based on a simple diameter difference and a pressure gradient. They are also inexpensive to operate and maintain. The difficulty lies in synthesizing a defect-free membrane efficiently, which most conventional methods fail to do. The aim of this research is to synthesize ZIF-8 membranes using a completely novel method known as electrochemical synthesis, for the purpose of propane-propylene separation. The membrane was synthesized by mixing together two solutions and passing a current through them using two electrodes placed in the resulting solution. One of the electrodes was attached to an AAO plate which the membrane was built on. The morphology and topography of the membranes was subsequently tested by use of an SEM and XRD and the gas separation properties were tested by use of gas chromatography. The results showed the creation a defect free membrane using this novel method. In addition, this membrane can separate the intended gases as it had a permeance of 35GPU and a selectivity of 44. This presents an important step for the future of both membrane synthesis and hydrocarbon separation, as it is a completely new method which can act as a strong and viable alternative to conventional fractional distillation.

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