

XI.14 Hydrogen Recovery and Carbon Dioxide Separation In Steam Methane Reformers (Phase II Project)

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If hydrogen is to be used as an environmentally-friendly fuel, hydrogen production costs must be lowered and carbon dioxide, a by-product of hydrogen production, must be separated for sequestration. This project will develop a membrane process to recover hydrogen and separate carbon dioxide from steam-methane-reformer pressure-swing-absorption plants. The process should increase hydrogen production by 15% while simultaneously producing a liquid carbon dioxide stream for sequestration. The value of the recovered hydrogen will offset the cost of the process. In Phase I, two novel membranes were produced: one to separate carbon dioxide, the other to separate hydrogen. Composite membranes with a carbon dioxide/hydrogen selectivity of 10 were prepared and tested as bench-scale membrane modules. A process simulation model, based on the performance of these membranes combined with hydrogen-permeable membranes, was used to design an efficient pressure-swing-absorption tail-gas treatment process. In Phase II, the membranes that were prepared in Phase I will be scaled-up to industrial scale and evaluated in a complete pilot-scale system, in order to demonstrate the technical and economic feasibility of the process.