# Introduction to $CO_2$ Capture and Separation

The $CO_2$ produced from fossil fuel combustion can be prevented from entering the atmosphere if it is permanently stored. One of the major proposed methods for storing $CO_2$, injection into subsurface geologic formations, requires a concentrated stream of $CO_2$. Many system configurations have been proposed to produce pure $CO_2$ and an energy carrier from fossil fuels and air. The $CO_2$ can be separated from the nitrogen rich effluent from fossil fuel combustion with air. Alternatively, the air can be pre-separated to provide a pure stream of oxygen to react with the fuel. Either hydrogen can be produced and separated or the resulting stream of mostly $CO_2$ and water can be separated by condensing the water.

Each of these $CO_2$ capture configurations requires mechanisms for gas separation. Methods now used to separate gases for $CO_2$ capture include solvent techniques, chemical adsorbents and membrane separations. All current technologies demand a significant energy input, and therefore cost, to regenerate the solvent or otherwise drive the separation. Research enabling efficient, low-cost $CO_2$ capture technologies will be required if fossil fuels are to be part of a low greenhouse gas emissions energy system.

Professor Schoonman of Delft University and Dr. Jansen of ECN lead the GCEP project in carbon capture and separation. This project seeks to develop reactive membranes capable of performing both hydrocarbon reformation reactions and energy efficient gas separation. Both $CO_2$ and hydrogen separating membranes will be explored.