

## **Introduction to Advanced Coal**

The global coal resource is enormous and more widely distributed than other fossil fuels such as oil or natural gas. Since coal is abundant and inexpensive, it is used extensively for electric power generation in the US, China, and India. A growing demand for transportation fuels and an alternative to petroleum may escalate the practice of converting coal to liquid fuels. Such processes require large energy inputs and have a significant carbon footprint. As a result, the challenge of reducing greenhouse gas emissions associated with the use of coal is a significant one.

In recent decades, most of the attention on advanced coal combustion has shifted from university-based research to private sector development. Therefore GCEP is interested in advanced coal research that addresses conceptual approaches to coal conversion that go beyond incremental improvements towards systems and processes that emphasize CO<sub>2</sub> emission reductions.

GCEP currently supports a program on coal energy conversion with aquifer-based sequestration led by Professor Reginald Mitchell. The process involves CO<sub>2</sub> capture in inherently stable forms through supercritical oxidation of coal in aquifer-derived water. The products of reaction, including CO<sub>2</sub>, are returned in the aqueous solvent to the aquifer. The project is divided into four research areas - Area 1: Systems Analysis, Area 2: Supercritical Coal Reforming, Area 3: Synthesis Fluid Oxidation and Heat Extraction, and Area 4: Aquifer Interactions. To date, progress has been made in each of these areas, including the system level models, thermodynamic property data and extensive materials research have been completed, and the reactor has been built. The design and assembly of other components of the system (combustor, heat exchanger, etc) are part of the ongoing and future work.