C1 chemistry refers to the conversion of simple carbon-containing materials that contain one carbon atom per molecule into valuable products. The feedstocks for C1 chemistry include natural gas, carbon dioxide, carbon monoxide, methanol and synthesis gas (a mixture of carbon monoxide and hydrogen). Synthesis gas, or syngas, is produced primarily by the reaction of natural gas, which is principally methane, with steam. It can also be produced by gasification of coal, petroleum coke, or biomass. The availability of syngas from coal gasification is expected to increase significantly in the future because of increasing development of integrated gasification combined cycle (IGCC) power generation.

Because of the abundance of remote natural gas, the advent of IGCC, and environmental advantages, C1 chemistry is expected to become a major area of interest for the transportation fuel and chemical industries in the relatively near future. The CFFLS will therefore perform a valuable national service by providing science and engineering graduates that are trained in this important area.

Syngas is the source of most hydrogen. Approximately 10 trillion standard cubic feet (SCF) of hydrogen are manufactured annually in the world. Most of this hydrogen is currently used for the production of ammonia and in a variety of refining and chemical operations. However, utilization of hydrogen in fuel cells is expected to grow significantly in the next century.

Syngas is also the feedstock for all methanol and Fischer-Tropsch plants. Currently, world consumption of methanol is over 25 million tons per year. There are many methanol plants in the U.S. and throughout the world. Methanol and oxygenated transportation fuel products play a significant role in the CFFLS C1 program. Currently, the only commercial Fischer-Tropsch plants are overseas, principally in South Africa (SASOL). However, new plants are being built or planned for a number of locations. One possible location for future F-T plant development in the U.S. is in the Alaskan oil fields.