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Rapid catalyst screening using a high pressure, tandem micro-reactor GC/MS

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The possibility of converting various biomass feed stocks directly to biofuels or value-added specialty chemicals using catalytic pyrolysis has precipitated a demand for a fast, reliable method to characterize newly developed catalysts. Catalytic pyrolysis is a three-step process: (1) the feedstock is first pyrolyzed (often referred to as "fast pyrolysis"), (2) the pyrolyzates flow through a catalyst bed and (3) the 'products' are identified and quantitated. The Tandem Micro-Reactor GC/MS system integrates these three processes into a single instrument. Studies indicate that by the end of the year bioethanol production will exceed the needs of E10 fuels, resulting in an oversupply of ethanol. Consequently, bioethanol appears to be the platform molecule for the production of value-added chemicals in the next decade. Thus, the catalytic conversion of ethanol appears to be an ideal process to use as a benchmark for illustrating the benefits of using the tandem micro-Reactor; ethanol is stable, and the ethylene selectivity is high using readily available zeolite catalysts. This work describes the findings of an evaluation of the Tandem Micro-Reactor GC/MS system based on the conversion of ethanol. The results of the following tests will be reported:

1. Monitor hydrocarbons formed as the temperature of the catalysis is heated at a fixed rate.
2. Monitor hydrocarbons formed at selected catalyst temperatures.
3. Determine the amount of sample converted to char using EGA-MS.
4. Monitor the surface activity of the catalyst using ethylene as a test probe.

Biography

R R Freeman has worked in gas-phase columns and instrumentation for over 25 years. In 1975, he designed and built the first gas chromatographic system that could be used to analyze THC in blood and urine. After careers at Varian, Hewlett Packard and J&W Scientific, he founded Air Toxics Ltd. which has become the world's largest 'air' environmental laboratory. Currently, he works with the R/D group at Frontier Laboratories. He has authored two books, several chapters and more than 50 articles on various aspects of separation sciences.

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