times. Other parameters can also be used to alter the order or retention time, such as the carrier gas flow rate.

[004] The column(s) in a GC are contained in an oven, the temperature of which is precisely controlled (e.g., electronically). The rate at which a sample passes through the column is directly proportional to the temperature of the column.

[005] One application of GC is for the analysis of crude oil. Crude oil, for example, may contain a mixture of chemical compounds from a family of several hundred chemical compounds. Some chemicals that may be found in crude oil include hexane, jet fuels, mineral oils, benzene, toluene, xylenes, naphthalene, and fluorine, in addition to other petroleum products and gasoline components.

[006] One useful tool for analyzing crude oil is its boiling point (BP) curve, as boiling point range is often a key controlling parameter for manufacturing petroleum products. GC is routinely employed for determining the boiling point range of oil products, as it is a fast and inexpensive method for providing information regarding the fuel-type present. A BP curve is a quantitative percent mass yield as a function of the boiling point of the hydrocarbon components of a sample.

[007] However, in the case of crude oil, two column systems are often required since the crude oil BP curve obtained by high temperature columns is not accurate in the region of Initial Boiling Point up to 25% of the BP curve, generally comprising methane through nonane. As a result, a second injection is conventionally made in a separate instrument to analyze the crude oil fraction in the region of methane through nonane. This second injection is often analyzed and identified using a Detailed Hydrocarbon Analysis (DHA) column. The identification on this longer DHA column is often used for providing the boiling point in the region up to 25%. In many cases, the DHA column requires different temperatures than the high temperature columns, thereby preventing both columns from being housed in a single gas chromatograph oven. Generally DHA columns are designed such that they have a limited temperature range and cannot coexist in the same oven as a crude oil column, which is heated to high temperatures.

Summary of Invention

[007a] According to an aspect of the present invention, there is provided a gas chromatography instrument including: a first autoinjector in communication with a first column and a second autoinjector in communication with a second column, and a first flame ionization detector in communication with the first column and a second flame ionization detector in communication with the second column, a first computer system, a second computer system, and a third computer system, wherein the first column is housed in a first compartment and the second column is housed in a second compartment wherein the first computer system utilizes data obtained from the first column to provide a boiling point curve of a sample being analyzed in the first column, wherein the second computer system utilizes data obtained from the second column to identify a component of a sample being analyzing in the second column, and wherein the third computer system utilizes data from both the first computer system and the second computer system.

Brief Description of the Drawings

[008] FIG. 1 shows an example of a GC system in accordance with aspects of the present invention.

Claims

1. A gas chromatography instrument comprising:

a first autoinjector in communication with a first column and a second autoinjector in communication with a second column, and

a first flame ionization detector in communication with the first column and a second flame ionization detector in communication with the second column,

a first computer system,

a second computer system, and

a third computer system,

wherein the first column is housed in a first compartment and the second column is housed in a second compartment

wherein the first computer system utilizes data obtained from the first column to provide a boiling point curve of a sample being analyzed in the first column,

wherein the second computer system utilizes data obtained from the second column to identify a component of a sample being analyzing in the second column, and

wherein the third computer system utilizes data from both the first computer system and the second computer system.

2. The gas chromatography instrument of claim 1, wherein the first compartment comprises an oven.

3. The gas chromatography instrument of claim 1, wherein the second compartment comprises an insulated thermal housing.

4. The gas chromatography instrument of claim 1, wherein the second column is a Detailed Hydrocarbon Analysis (DHA) column.

5. The gas chromatography instrument of claim 1, further comprising a heater configured to heat the second column.

6. The gas chromatography instrument of claim 5, wherein the heater is a thin film heater.

7. The gas chromatography instrument of claim 1, wherein an electronic device that provides heat to the second column also provides heat to at least one other component of the instrument.

8. The gas chromatography instrument of claim 5, wherein the heater heats the second column to a maximum of 300°C.

9. The gas chromatography instrument of claim 1, further comprising a first controller that controls the temperature of the first column.

10. The gas chromatography instrument of claim 9, wherein the first controller is configured such that the temperature of the first column is at least a temperature necessary to determine a boiling point of a sample being analyzed in the first column.

11. The gas chromatography instrument of claim 10, wherein the sample is crude oil.

12. The gas chromatography instrument of claim 1, wherein the second compartment comprises a liquid coolant distributor.

13. The gas chromatography instrument of claim 12, wherein the liquid coolant distributor comprises a valve and a shower head.

14. The gas chromatography instrument of claim 1, wherein the second compartment comprises a microfluidic switch.

15. The gas chromatography instrument of claim 14, wherein the microfluidic switch is configured to provide a preselected fraction of a sample to the second column.

16. The gas chromatography instrument of claim 15, further comprising a heating mechanism configured to heat the microfluidic switch.