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**TeGrotenhuis et al.**

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(54) **MICROCHANNEL REACTORS WITH TEMPERATURE CONTROL**

(75) Inventors: **Ward E. TeGrotenhuis**, Kennewick, WA (US); **David L. King**, Richland, WA (US); **Greg A. Whyatt**, W. Richland, WA (US); **Christopher M. Fischer**, Yakima, WA (US); **Robert S. Wegeng**, Richland, WA (US); **Kriston P. Brooks**, Kennewick, WA (US)

(73) Assignee: **Battelle Memorial Institute**, Richland, WA (US)

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See application file for complete search history.

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*Primary Examiner*—Timothy C. Vanoy

*(74) Attorney, Agent, or Firm*—Derek Haughan; Frank Rosenberg

(57) **ABSTRACT**

Microchannel devices and method of use are disclosed wherein a reaction microchamber 52 is in thermal contact with a heat exchange channel 61. An equilibrium limited exothermic chemical process occurs in the reaction microchamber 52. Sufficient heat is transferred to the heat exchange channels to substantially lower the temperature in the reaction microchamber 52 down its length to substantially increase at least one performance parameter of the exothermic chemical process relative to isothermal operation. Optionally, an endothermic reaction occurs in the heat exchange channel 61 which is sustained by the exothermic chemical process occurring the exothermic reaction chamber. Both the reaction chamber 52 and the heat exchange channel 61 can be of micro dimension. Catalyst 75 can be provided in the microchamber 52 in sheet form such that reactants flow by the catalyst sheet. A microchannel reactor 100 can be formed by integrally bonding an alternating stack of thin recessed sheets wherein the recesses in the sheets define the flow paths.

**48 Claims, 9 Drawing Sheets**

