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Title: Use of Fiber Film Reactors to Effect Separation and Reaction Between Two Immiscible Reaction Components.

Background: Chemical reactions between two fluids are conducted in reactors that mix droplets of one phase in the other. Dispersed small droplets provide the surface area that allows chemical reaction between the fluids to occur. The smaller the droplets the greater the reaction. Unfortunately, it can be difficult to coalesce the droplets back into one phase for further processing. The specialty chemical industry, the pharmaceutical industry, and the biodiesel industry all rely heavily on dispersion reactors. Large biodiesel plants rely on centrifuges to coalesce and separate the phases rapidly.

Invention Description: A continuous static non-dispersive fiber reaction process in which reactive components contained in immiscible streams are intimately contacted to effect chemical reactions and separations. The tubular reactor contains wettable fibers onto which one stream is substantially constrained and the second stream flows between the wetted fibers to continuously create a new interface to efficiently bring about contact of the reactive species and thus promote reactions or extractions. Co-solvents and phase transfer catalysts may be employed to facilitate the process.

Benefits: The new reactor is 60X more efficient at achieving mass transfer between the phases than conventional reactors. That means it is 60X faster and 60 smaller for the same volume processed. In addition, the phases come out of the static reactor separated without centrifuges. Fiber Reactor™ chemical processes can be built with less capital and will operate with less operation costs. Engineering calculations indicate that world scale biodiesel reaction trains can be built for less than half the capital of conventional plants and use less than half the energy to operate.

Market Potential/Applications: The immediate potential application is for biodiesel manufacturing. Currently the US has capacity to make 2.5 billion gallons of biodiesel. Consumption of petroleum diesel is 60 billion gallons per year and gasoline consumption is 120 billion gallons per year. Biodiesel could replace a substantial portion of 180 billion gallons per year in the next 10-15 years. The Fiber Reactor will substantially reduce the costs of capital and production of biodiesel.

IP Status: U.S. patent assigned to John L. Massingill, Jr. **7,618,544 (November 2009).**

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