

Residence time compensating device

Optimal reactor configurations for physio-chemical processes

A Virginia Commonwealth University researcher has created a new design for a radial flow device. Current radial flow devices have moving parts such as an impeller which drive the fluid. However, as the part of the new design, this device does not have any moving parts and uses relatively low pressure driven flow. Benefits of this unique design include the optimization of radial flow characteristics for the enhancement of heat (energy) transfer, mass transfer, separations, biological reactions and systems, and small molecule reactions. This device can also be constructed using 3D printed materials, which could further lower the cost of production.

The technology

The radial system is characterized by what can be termed as “residence time compensation.” During residence time compensation, reaction or molecular transport rates, which typically decrease along a process path, are compensated by an accompanying increase in the local flow residence times due to the radial flow geometry of the device. The compensating effect of increasing residence time to decreasing rates for the radial flow device in general holds for various processing applications. These applications include energy transfer such as solar, mass transfer and separation processes, where the temperature/concentration gradients decrease along the path and are compensated by residence time increases. Biological and/or cellular growth reactions involving mammalian or bacterial cells are also well suited for this geometry. Semi-permeable membranes can also be used at the inlet/outlet interface instead of thermal walls for mass transfer recycling, such as in an artificial kidney design, dialysis, and water purification.

Benefits

- » Provides a low flow/low pressure system
- » Consists of interchangeable 3D printed parts
- » Can be used multiple times
- » Low-cost production

Applications

- » Small molecule reactions
- » Bioreactor and cellular growth
- » Biological systems
- » Solar heating and energy transfer
- » Mass transfer and separations
- » Microfluidics

Patent status:

Patent pending: U.S. and foreign rights are available.

License status:

This technology is available for licensing to industry for further development and commercialization.

Category:

Engineering and physical sciences

VCU Tech #:

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Contact us about this technology

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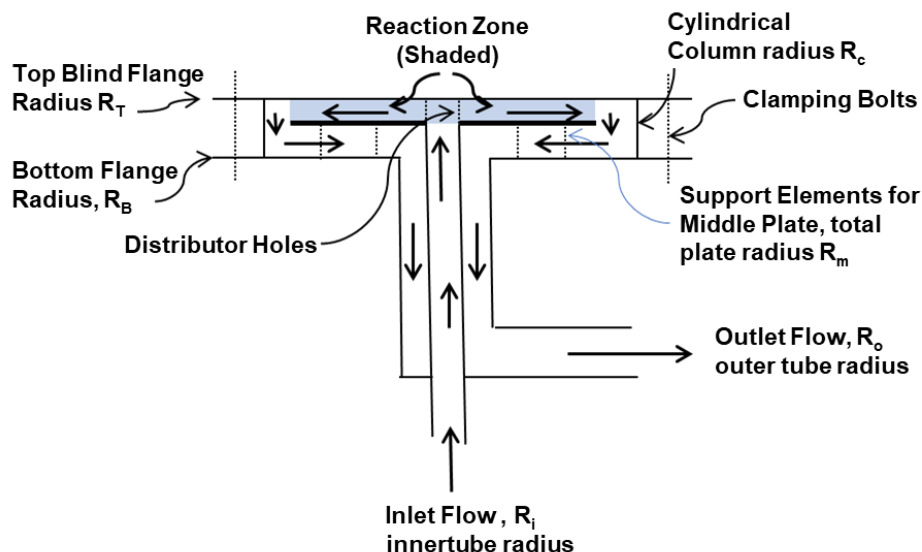


Figure 1: Schematic view of the radial flow device highlighting flow pathways and absence of moving parts.