

606d Juice Irradiation with Taylor-Couette Flow

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A novel reactor is described with flow characteristics approaching that of ideal plug flow but with a residence time that is uncoupled from the hydrodynamics or boundary layer characteristics. The design described consists of an inner cylinder that rotates within a stationary but larger outer cylinder. At low rotation rates a laminar, hydrodynamic configuration called Taylor-Couette flow is established consisting of a system of circumferential vortices within the annular fluid gap. The latter constitutes a spatially periodic flow that is the hydrodynamic equivalent to cross flow over a tube bank or lamp array. These vortices provide radial mixing, reduce the boundary layer thickness and are independent of the axial flow rate and thus the fluid residence time. An additional feature of the rotating design is the repetitive exposure of the fluid parcels to a minimum number of lamps which substantially reduces the maintenance requirements.