Academic Lecture

Speaker：Jaap Schouten

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Topic：MULTIFUNCTIONAL DEVICES FOR INTENSIFIED CHEMICALS PROCESSING

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Venue： Multifunctional Hall, IPE Building

Abstract

In this presentation an exploratory expedition will be made along a number of new multifunctional reactor technologies. First, examples will be demonstrated of **microreactors** and microchemical systems that provide intricate geometries with characteristic micrometer to millimeter length scales for optimum mixing, mass and heat transfer, (catalytic) reaction, and product separation. It will be shown that the benefits of these miniaturized systems can be used to enhance productivity, selectivity, energy efficiency as well as to open up new reaction pathways.

Next, the potential of **solid foam packings** as alternatives to well-known structured catalyst supports will be demonstrated. Solid foam packings are available in a variety of materials and pore sizes. They combine the properties of high surface area and low solid holdup suited for low pressure drop applications in different gas-liquid up/down flow co/countercurrent configurations. High rates of mass transfer are obtained at relatively low energy dissipation.

Finally, the **spinning disks contactor** will be introduced. This novel technology uses centrifugal accelerations to create thin highly sheared layers between rotating surfaces. The fluid dynamics within these layers result in significant enhancement in heat and mass transfer rates. The spinning disc reactor operates in continuous mode and noticeably reduces the inventory of hazardous chemicals. Multiple sets of disks can be stacked, leading to a small-scale rotating chemical plant in which characteristic functionalities and unit operations as pumping, compression, mixing, heating, reaction, extraction, evaporation, distillation, or crystallization are fully integrated on interconnected and stacked sets of rotating disks.

These new and challenging reaction and separation technologies provide highly promising perspec tives for future small-scale ‘green’ production plants. Chemicals processing will be more flexible using these small-sized units and takes place fully automated, just-in-time, close to the raw materials source, or at the location of use.