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Gravitational* SPLITT

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Continuous
Preparative Particle Separation System

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Gravitational SPLITT

Introduction

Split-flow thin-cell (SPLITT) fractionation is a relatively new class of separation methods, invented by Prof. J. C. Giddings at University of Utah. Gravitational SPLITT can be used to separate a diverse range of samples such as environmental (sediments, colloids), pharmaceutical/biotech (cell organelles, bioparticles, starch granules) and other samples as diamond powders, carbon black, silica etc. with a size from 50 µm down to about 1 µm (for laboratory use only).

Working Principle

SPLITT fractionation utilizes the well-controlled hydrodynamics found in thin cells and the simplicity and flexibility of an externally applied field. The high stability of flow leads to high resolution separations and reproducible results. Since a known field is applied, the separation is predictable and can be fine-tuned for individual samples. The field, typically gravitational in nature, is oriented in a direction perpendicular to the laminar flow of the carrier fluid through the cell. When the field is provided by the Earth's gravity, the overall cell design is a simple flow channel, whereas, when a centrifugal field is used, the channel design is more complex (see Centrifugal SPLITT).

The side view of the basic SPLITT process is shown below. Particles are introduced into the cell through the top inlet. Simultaneously, pure (particle-free) carrier solution is pumped into the cell through the bottom inlet. The flow rates are controlled so that an inlet splitting plane is formed at a position close to the top wall. The particles in the sample feedstream are compressed in a thin lamina between the top wall and this inlet splitting plane, and then migrate toward the bottom wall at different velocities depending on their size, mass or density. Particles with a higher lateral migration velocity cross the outlet splitting plane and are collected from the bottom outlet; the remainder exit from the top outlet. As a result each SPLITT operation separates particles into two fractions at a preset cutoff diameter.
In the Gravitational SPLITT system, this cutoff diameter can be easily controlled by adjusting pump settings - the inlet and outlet splitting planes are controlled by the relative inlet and outlet flow rates.

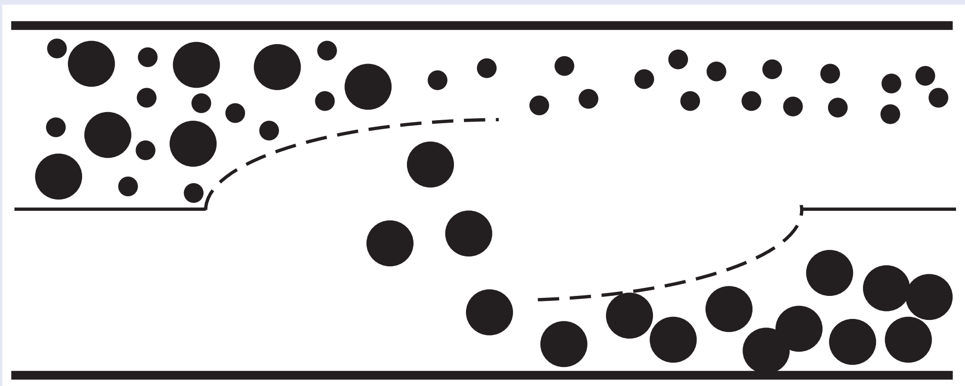

Fig.1: Schematic side view of a typical SPLITT channel

Why use Gravitational SPLITT ?

- SPLITT enables the user to perform continuous preparative particle separations from mg to g quantities.
- SPLITT is applicable for particles in the range of 1 - 50 µm
- Innovative but simple technique based on hydrodynamic flow effects with no membranes involved thus eliminating membrane interactions and adsorption problems.
- Size cutoff for a given application can be selected flexible since it depends only on the inlet and outlet flow rates.
- Very fast and gentle particle separation, compatible with a broad range of suspension composition and aqueous solvents.
- Capability for rapid and flexible isolation of narrow size cuts and the high efficiency removal of oversized or undersized particles.

Specifications

Basic Gravitational SPLITT System

System Dimensions:
46.5 x 10.5 x 12.5 cm

Channel Dimensions:
Length 20 cm, width 4 cm,
thickness 380 - 1150 µm

Weight:
6.8 kg

Flow Rate Range (typical):
1 - 100 mL/min at back pressure < 2.5 bar

Particle Separation Range:
1 - 50 µm

Pumps:
2 peristaltic pumps for sample introduction and carrier feed flow

PC Requirements:
Windows; min. 32 MB RAM,
for the control of the peristaltic pumps

Compatible Solvents:
Aqueous solvents only

Sample Throughput (typical):
1 - 10 g/h; depending on sample density; amounts quoted are for samples with density greater than 2.5

Sample Concentration (typical):
1 % solids

High Throughput Gravitational SPLITT

System Dimensions:
175 x 22 x 12.5 cm

Channel Dimensions:
Length 100 cm, width 14 cm,
thickness 380 - 1150 µm

Weight:
55 kg

Flow Rate Range (typical):
10 - 2000 mL/min at back pressure < 2.5 bar

Particle Separation Range:
1 - 50 µm

Pumps:
1 peristaltic pumps for sample introduction
and 1 FMI type metering pump for carrier feed flow

PC Requirements:
Windows; min. 32 MB RAM,
for the control of the pumps

Compatible Solvents:
Aqueous solvents only

Throughput (typical):
100 - 500 g/h, depending on sample density; amounts quoted are for samples with density greater than 2.5

Sample Concentration (typical):
1 % solids

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