



### AN INTEGRATED MICROFLUIDIC DEVICE FOR CONTINUOUS CONCENTRATION OF A DILUTE SOLUTION OF A SOLUTE IITM Technology Available for Licensing

#### Problem Statement

- The detection of several solutes has to be done at the low concentrations which prevail in the system.
- In this instant, several pollutants arise at ppb levels, and it is difficult to detect them at such low concentrations.
- There is a need to detect these pollutants on site using compact portable devices.
- In essence of prior arts literature survey, there is **no device disclosed which** provide the details of concentration of a solute of interest, so that the cost of purification and separation can be reduced, along with other features.
- Hence, the present patent provides the solution to address the above issues efficiently.

#### Technology Category/ Market

**Chemical Engineering:** Integrated Microfluidic Device for continuous concentration of a dilute of a salute;

**Industry:** Environment Engineering, Manufacturing Chemical, Catalysts, Extraction & Mining;

**Applications:** Solute detection, separating, purification of solute, Semiconductor Manufacturing devices, Pharmaceuticals, Chemical plants.

**Market:** The global computation fluid dynamics market attained a value of **USD 1.8** billion in 2020 & is expected to grow in the forecast period of 2023 to **2028** at a CAGR of **12%** to reach **USD 3.5** billion by **2026**.

#### Technology

- Present invention describes about an integrated microfluidic device for concentrating a dilute solution of a solute based on combining sequentially.

- Said device includes following elements as listed in below:

1

• **1<sup>ST</sup> Section contains microchannel consisting of cross junction which establishes contact between two phases and is used for generating slugs/bubbles;**

2

• **2<sup>ND</sup> section channel has a diverging zone followed by a straight section and converging zone. The shear rates are low at a gas-liquid interface ensures that the biomolecules do not denature at the interface**

3

• **3<sup>RD</sup> section consists of the separator attached to the exit of microchannel where the foam is separated from the aqueous solution allowing continuous operation.**

- The nitrogen gas, from the gas cylinder, is sent through the central inlet.
- The liquid solution is pumped using syringe pumps through side inlets.
- The gas-liquid interface is available for adsorption of solute after micro bubbles are formed and adsorption proceeds till bubbles reach the separator.
- The separator separates the foamate & residual phase based on density & collect them separately.

#### Intellectual Property

**IITM IDF Ref. 1586;**  
**IN Patent No. 412212 (Granted)**

#### TRL (Technology Readiness Level)

**TRL- 4,** Proof of Concept ready, tested and validated in Laboratory

#### Research Lab

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#### Key Features / Value Proposition

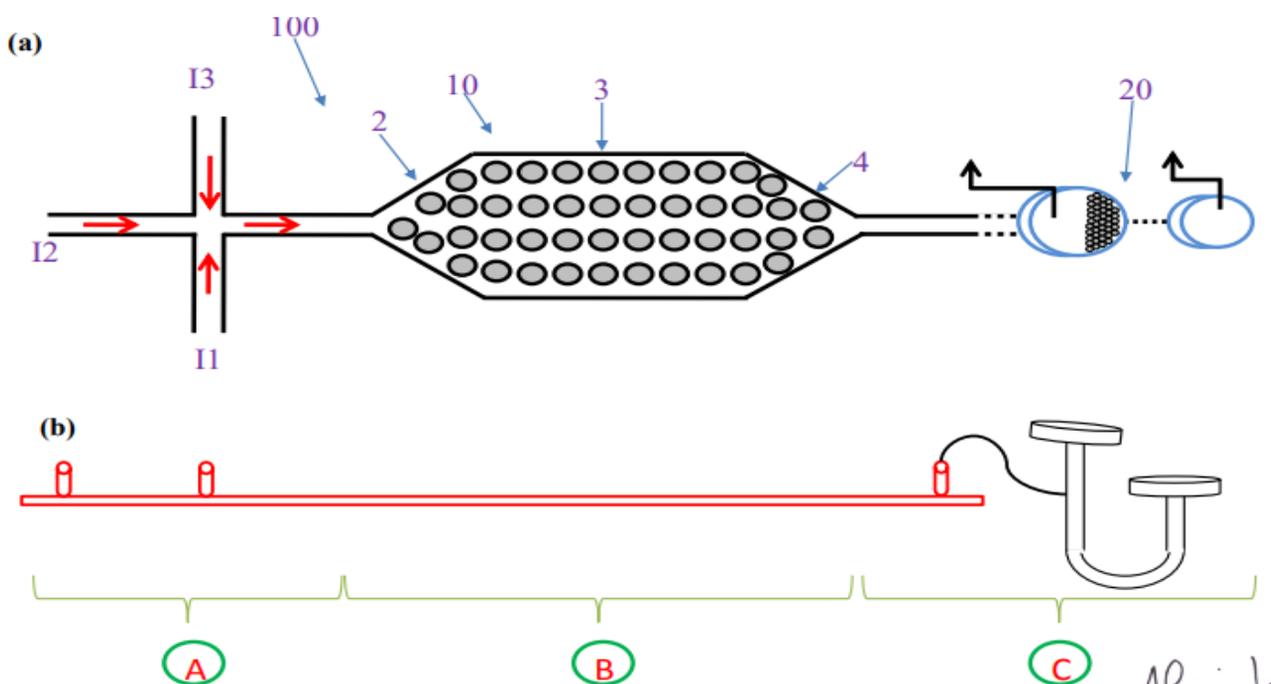
##### ❖ Technical Perspective:

1. The device can be used to concentrate a dilute solution of a surface active solute or separate a surface active solute from a mixture of other solutes.
2. The device is portable and easy handle and cost effective.

##### ❖ Industrial Perspective:

1. Patented device is portable and easy to handle.

#### Images



**FIG.1**

**FIG. 1a** Illustrates the schematic representation of top view of a microfluidic device;

**FIG 1b:** Illustrates the schematic representation of front view of the microfluidic device;

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