Annular contactor.

KEYWORDS

- ❑ CONTACTOR
- ❑ ANNULAR GEOMETRY
- ❑ SINGLE MODULE
- ❑ LIQUID CONTAINED MEMBRANES
- ❑ HOLLOW FIBRES
- ❑ SPECIATION

AREA

- ❑ CHEMISTRY & BIOTECHNOLOGY

CONTACTS

➢ PHONE NUMBERS
+39.06.49910888
+39.06.49910855

➢ EMAIL
u_brevetti@uniroma1.it

Priority Number
102020000004138_27.02.2020.

Patent Type
Patent for invention.

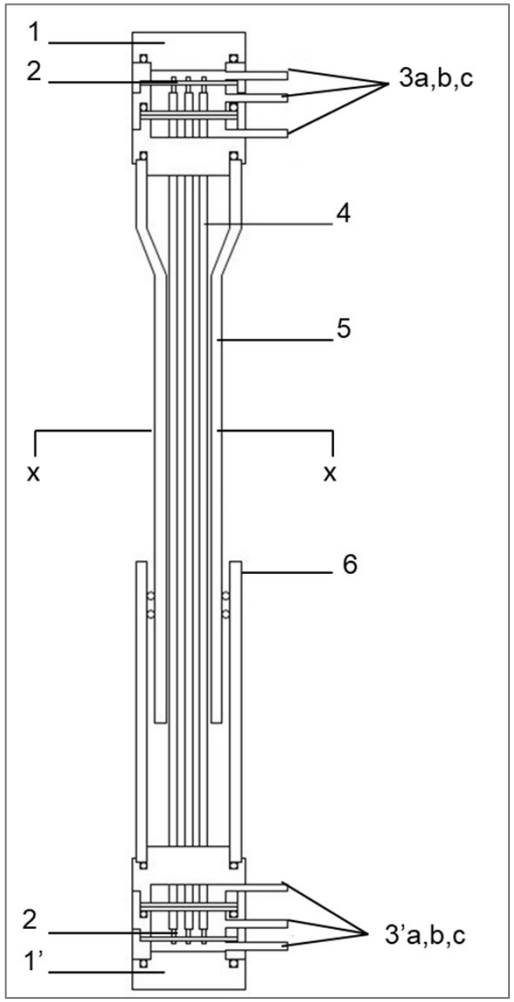
Ownership
Sapienza Università di Roma 100%.

Inventors
Silvia Canepari, Domenico Ginese, Riccardo Ferrante, Maria Luisa Astolfi, Anna Maria Girelli, Elisabetta Marconi.

Industrial & Commercial Reference
Fields of interest of liquid membrane technologies (chemical, pharmaceutical, biotechnological, environmental, etc.).

Time to Market
TRL 4 – Small scale prototype built in a laboratory environment (“ugly” prototype).

Availability
Cession, Licensing, Research, Development, Experimentation and Collaboration.



Abstract
The device of the invention is a single-module annular geometry contactor that allows the transport of a solute between two liquid phases consisting of a feed solution and a receiving solution by means of a liquid membrane solution confined in the annular geometry compartment made by a pair of coaxial hollow fibres.
The dimensions of the device are scalable and it can be used both as separation and purification system and as selective preconcentration system.
The main advantages of the proposed device are: flexibility, speed of the target compound transfer process and reduction of the solvent volume used.

Fig. 1 Longitudinal schematic section of the annular contactor. 1, 1') stopper made of polytetrafluoroethylene (PTFE); 2) first hollow fiber with a smaller diameter; 3a,b,c, 3'a,b,c) threaded spouts (in steel) for the feeding (inlet/outlet) of the feed, receiving and membrane solutions; 4) second hollow fiber with a larger diameter; 5) first cylinder (glass) with a smaller diameter; 6) second cylinder (glass) with a larger diameter.

Annular contactor.

Technical Description

The annular contactor is provided with a shell with the ends and has at least one treatment unit for the transport of a solute between two phases consisting of a feed solution and a receiving solution by means of a membrane solution, confined in the annular geometry compartment made from a pair of coaxial hollow fibers. The feed solution, the receiving solution and the membrane solution, all countercurrent to each other, flow within a single module. A solute concentration or removal process can take place in the contactor if the receiving solution flows inside the first fiber with a smaller diameter (the source solution outside the second fiber with a larger diameter) or outside the second fiber (the source solution within the first fiber).

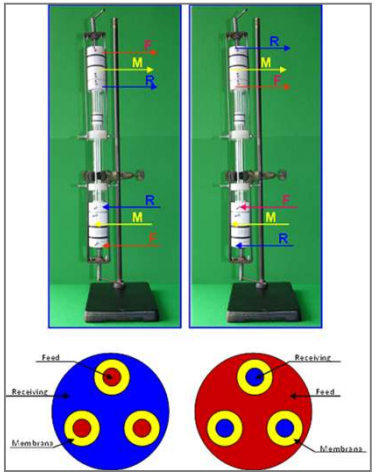


Fig. 2 Annular contactor and working method; feed solutions (F), receiving solution (R), membrane solution (M).

Technologies & Advantages

The one-module annular contactor of the invention is much more efficient than the two-module contactors known in art. The one-module contactor has been designed to minimize the disadvantages of two-module arranged liquid membrane systems (such as the slowness of the process and the large amount of membrane solution required due to the discontinuity between extraction and removal operations) and, at the same time, maintain the flexibility and ease of use that is characteristic of hollow fiber contactors.

The annular geometry of the invention device gives the system great flexibility. This annular contactor allows, in fact, to reduce to a minimum the membrane/exchange surface ratio and to vary the volume ratios between source and receiver solutions simply by alternating the feeding of the solutions inside the fibres.

The two extraction and removal operations are then carried out without the use of systems arranged in two modules, speeding up the transport process and reducing the volume of membrane solution.

Applications

The proposed device can be used with all possible solutions aqueous and with polar and apolar solvents that meet the specifications indicated by the manufacturer of the materials and fibers used. For example solvents suitable for use as membrane solutions can be: dichloromethane, kerosene and 1,2-dichloroethane and the carriers: Aliquat 336 and (-) - dodecyl – N – methyl – ephedrinium bromide).

The device of the invention was coupled to an inductively coupled plasma spectroscopy with optical detection (ICP-OES) for the determination of trivalent and hexavalent chromium in liquid samples. The performance of the method in terms of percentage extraction efficiency of hexavalent chromium and percentage variation coefficient were greater than 85% and less than 5%, respectively.

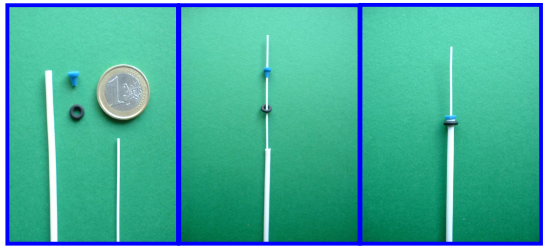


Fig. 3 Method of fixing the fibers with a larger diameter..

CONTACTS

- PHONE NUMBERS
+39.06.49910888
+39.06.49910855

- EMAIL
u_brevetti@uniroma1.it