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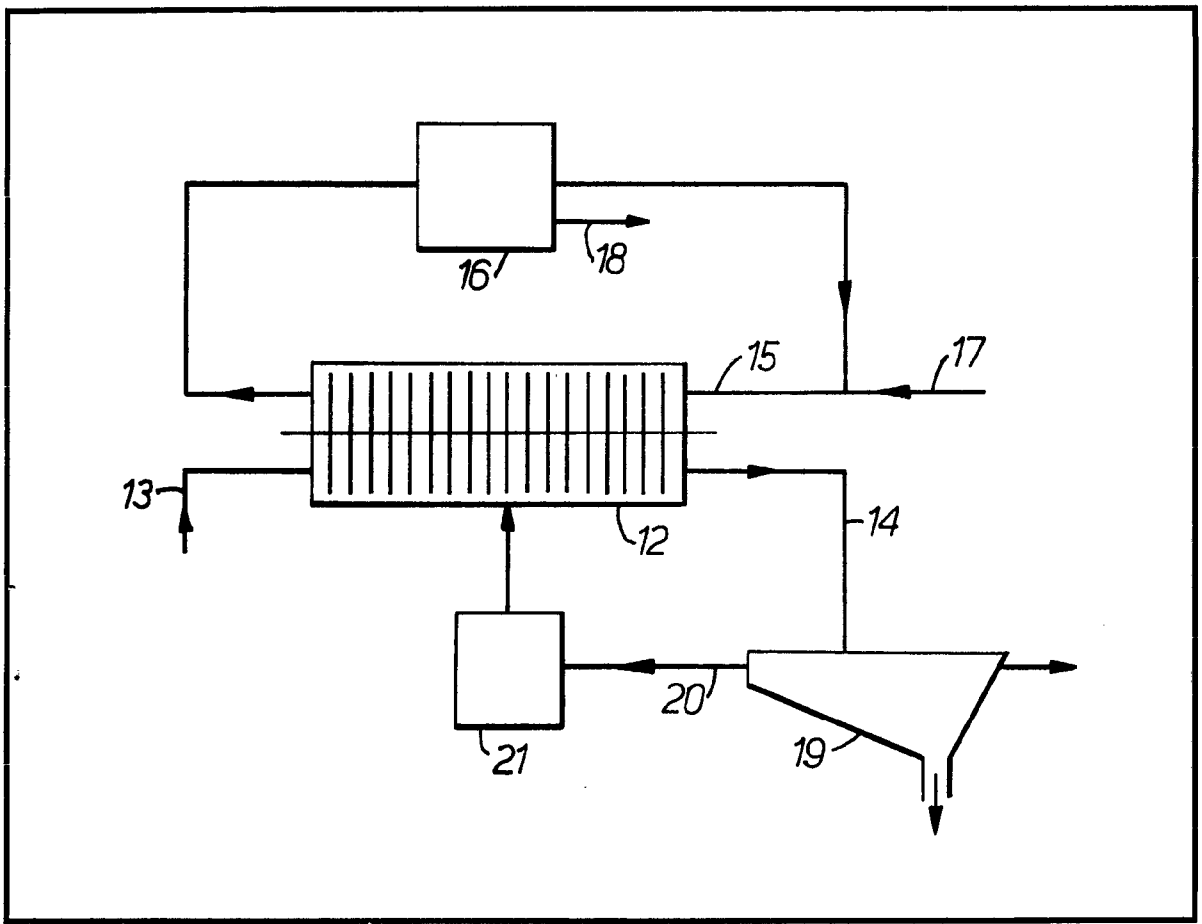
(54) Solids recycling in solvent extraction

(57) In an extraction process for extracting values from a first stream into a substantially immiscible second stream using a multi-compartmental rotary contactor, unwanted solids formed in the contactor 12 and discharged at least partly with the first stream 14 are separated at 19 and re-entered into the contactor intermediate the points at which the streams are discharged.



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The drawing originally filed was informal and the print here reproduced is taken from a later filed formal copy.

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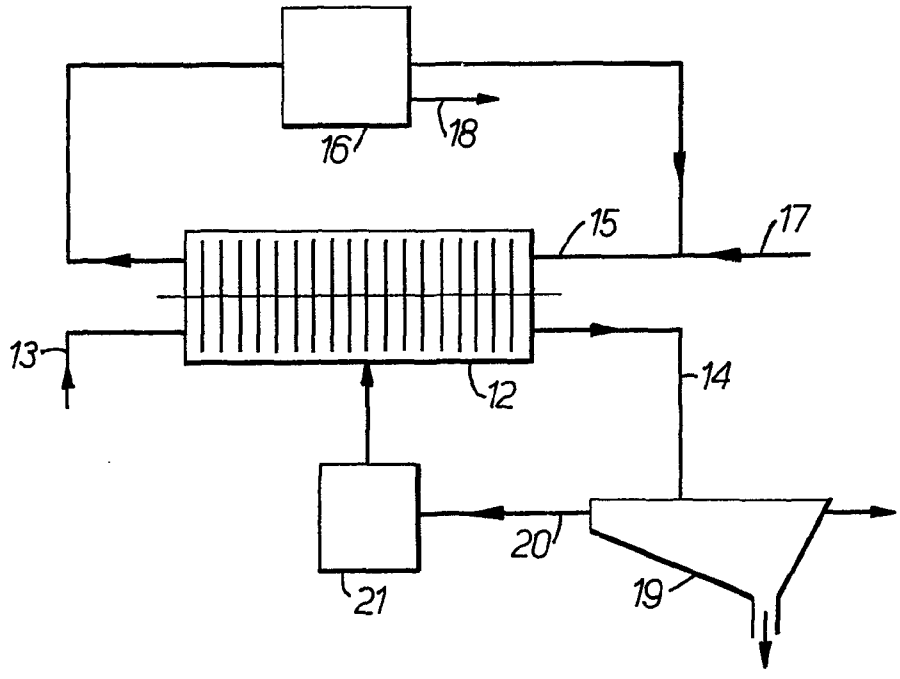

SPECIFICATION

Extraction process

This invention relates to an extraction process using a multi-compartmented, rotary, contactor for bringing into contact a first stream containing values to be extracted and a second immiscible stream consisting of, or including, an extractant for the values. Examples of such a process are described in U.K. Specification No. 1527269 for oil sands and U.K. Specifications Nos. 49179/77 and 9811/78 for the extraction of uranium values. The contactor is exemplified by U.S. Patent No. 3649209 and U.K. Application No. 23633/78.

Particularly when the first stream contains fines and slimes, as when the stream is a mineral slurry, crud is sometimes, but usually intermittently, formed in the contactor, usually as an interfacial layer between the two discrete streams. The crud is an emulsion of fines and can contain extractant and the values to be extracted. If the crud wholly or partly leaves the contactor with the first stream containing the raffinate and is discarded, there is a loss of both extractant and the solute and hence a loss of extraction efficiency. In addition, the crud is difficult to dispose of. If on the other hand the crud is separated and re-entered into the contactor with the first stream, frothing in the contactor occurs at the end where the second stream leaves, rendering it difficult to discharge the second stream without inclusion of constituents of the first stream.

The present invention resides in an extraction process, in which a first stream containing values to be extracted and a substantially immiscible second stream consisting of, or including, an extractant for those values are brought into contact in a multi-compartmental, rotary, contactor, and crud formed in the contactor, and discharged with at least the first stream, is separated and reentered into the contactor intermediate the points at which the streams are discharged. Any extractant and values to be extracted contained in the crud are then captured by the second stream, while any frothing that may occur does not extend to the discharge points.

The invention will be more readily understood by way of example from the following description of a process in accordance therewith, reference being made to the accompanying flow diagram of the process.

The process is illustrated by the extraction of uranium values from a uranium containing aqueous stream, but other values can be extracted in the same way.

The process makes use of a multi-compartmented rotary contactor 12 as described in U.S. Patent Specification No. 3649209 having a rotor mounted for rotation within a stationary drum. An aqueous slurry stream 13 of uranium-containing ore is fed continuously into a first end of the contactor and the stripped slurry is discharged at 14 at the second end. A counter-current stream 15 containing an extractant for uranium values is fed into the contactor at the second end and is discharged at the first end after having been brought into initimate contact with the slurry stream 13 in the compartments of the contactor. The extractant may be a chelating agent or a suitable ion-exchange resin in particulate form carried in a carrier liquid, e.g. kerosene. The extractant stream is immiscible with the slurry stream and has a smaller specific gravity, the two streams passing through the contacter as discrete phases apart from the intermingling taking place by the contactor action. The extractant stream leaving the contactor and containing the captured uranium values is stripped of the uranium values in 16 and is recycled to the contactor with make-up extractant as required on line 17. The separated uranium values leave on line 18 for further treatment.

Any crud formed in the contactor 12 and containing minor proportions of the extractant and the required uranium values pass through the contactor with the slurry stream 13 and leaves the discharge stream 14. That stream passes to a settling tank 19, where the solids and liquid separate and are separately discharged and where the crud forms an uppermost layer.

The crud layer in the settling tank 19 is drawn off on line 20 into a crud compartment 21 and is reentered into the contactor 12 through a port at or adjacent the bottom of the stationary drum of the contactor and located intermediate the contactor ends and preferably in the middle third of its axial length. The reintroduced crud is subject to treatment by the extractant stream 15, and is stripped of contained extractant and uranium values, which are recovered. The remaining constituents become absorbed in the slurry stream and are discharged with that stream. Any frothing that may occur due to the introduced crud settles reasonably rapidly and does not extend to the end portions of the contactor so that there is no frothing where the streams discharge from the contactor. Consequently there is little danger of the extractant stream leaving the contactor having included impurities from the aqueous slurry stream.

The system described has the further merit that the discharged constituents of the slurry stream are freed of crud, enabling those constituents to be discarded with greater ease than would otherwise be the case.

CLAIMS

1. An extraction process, in which a first stream containing values to be extracted and

a substantially immiscible second stream consisting of, or including, an extractant for those values are brought into contact in a multi-compartmental, rotary contactor, and crud formed in the contactor, and discharged with at least the first stream, is separated and re-entered into the contactor intermediate the points at which the streams are discharged.

2. An extraction process according to claim 1, wherein the first and second streams are passed countercurrent through the contactor.

3. An extraction process according to claim 1 or 2, wherein the crud is re-entered into the contactor in the middle third of the axial length thereof.

4. An extraction process according to claim 1, 2 or 3, wherein the discharged crud and first stream is allowed to settle in a settling tank and the crud separated as an upper layer for re-entry to the contactor.

5. An extraction process according to any one of the preceding claims, wherein the contactor comprises a rotor mounted for rotation within a stationary drum, discs rotatable with the rotor being provided to divide the drum into interconnected compartments, the discs carrying buckets adapted to carry portions of the first stream into the second stream and portions of the second stream into the first stream during passage of the streams through the contactor.

6. An extraction process according to any one of the preceding claims, wherein the first stream contains uranium values.

7. An extraction process according to any one of the preceding claims, wherein the extractant is in the form of a chelating agent or ion-exchange resin in a carrier liquid.

8. An extraction process substantially as described herein with reference to the accompanying drawing.

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