RESEARCH OF EXTRACTORS USED IN THE PRODUCTION OF INORGANIC SUBSTANCES

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According to the principle of interaction or the method of phase contact, extractors are divided into two groups: stepped and differential-contact. Within these groups, extractors are often divided into gravitational (the phase velocity in them is due to the difference in the densities of these phases) and mechanical (when energy flows are added from the outside by mechanical mixing, centrifugal force, piston pulsate. etc.)

In almost any of the apparatuses of the named groups, in order to increase the contact surface of the phases, one of the phases is dispersed in various ways and distributed in the other, continuous phase in the form of drops. After each mixing of the phases in the apparatuses, the separation of these phases follows, which is necessary primarily for the regeneration of the extract ant (under the action of gravitational or centrifugal forces). It should also be noted that continuous-operating extractors are usually used in industry.

Step extractors. The extractors of this group consist of discrete stages, in each of which phase contact occurs, after which they are separated and move counter currently to subsequent stages.

Each stage of such an extractor consists of a mixer 1, where the actual extraction process takes place with intensive mixing of the phases, and a sump 2, in which the extract is separated from the caffeinate. In the mixer, the phases are completely mixed (i.e. this apparatus works according to the model of ideal mixing-MIS) and as a result, the mixer usually reaches a state of equilibrium between the phases. Thus, in one stage, the phases move concurrently with respect to each other, while in the plant as a whole, a countercurrent movement of the phases is created.

With a cascade connection of stages the heavy phase moves from stage to stage by gravity, and the light phase must be pumped by pumps 3. In horizontal

mixing-settler extractors, pumps are installed to move the light and heavy phases from stage to stage.

Pumps for moving the light phase are not shown), which complicates the extraction plant and increases the cost of its operation. In the event that the equilibrium between the phases is established quickly, the role of the extractor instead of the mixer with a stirrer can be performed by pumps.

The advantages of mixing and settling extractors include their high efficiency (the efficiency of each stage can approach one theoretical separation stage), the ability to quickly change the number of stages, suitability for operation in wide ranges of changes in physical properties and phase volume ratio, relatively easy scaling, etc. Disadvantages of these extractors are a large occupied production area, the presence of mixers with individual drives, large volumes of gravity settling chambers.

In the extraction of inorganic substances, one or more substances are usually removed from the aqueous phase with one extractant.

As a rule, the extraction of inorganic substances is due to the chemical interaction of the solute and the solvent. Apparently, in the future, liquid extraction will be intensively used to isolate most of the metals of the periodic system, the cost of which approaches the cost of copper. Although some solvents have the necessary stability and selectivity for copper, nevertheless, economic calculations usually show the inexpediency of using an extraction process to extract copper due to the high cost of chemicals needed to obtain a conditioned product and stripping.

For a significant part of extraction processes, especially for the extraction of inorganic substances, the reaction of complex formation in the organic phase is characteristic. According to some authors [17], if the interaction energy of particles in a solution is high, then the chemical effects present in the system, which can be described by chemical equations for the formation of complexes and associates, prevail over the physical effects that cause the solution to be noni deal.

Accounting for the influence of chemical reactions on mass transfer through the acceleration factor in the extraction of inorganic substances has not found wide distribution, however, primarily because the calculated values of E are not amenable to simple experimental verification. Indeed, for this it would be necessary to experimentally determine the extraction rate without a chemical reaction for the formation of the extractable compound, and this, as a rule, is impossible.

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