A New Process Structure for Simultaneous Separation of Multiple Components of High Purity

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Sustainability requires the systematic recycling of materials. The challenge is that waste is usually not sorted by type. As a result, the treatment of waste streams requires complex and costly processes. At the same time, components that are present in low concentrations in the waste stream cannot be economically recycled, even if they are valuable in themselves.

Examples are the recycling of lithium batteries or the processing of electronic waste. Both types of waste contain valuable components, such as rare earths, which it is desirable to recover. This is particularly important as the EU has identified rare earths as critical materials. Li batteries contain various valuable components in varying concentrations, depending on the manufacturer and the specific design. A process must be able to respond to this variation in the feed stream. It is also desirable to be able to separate low-concentration components with high purity. To solve this separation task, complex and multi-step processes are proposed in the literature.

This contribution presents a process based on reactive solvent extraction, using the separation of precious metals as an example, that fulfils exactly these requirements without the need for multiple process steps. The metals can be separated to a high degree of purity and several metals can be obtained simultaneously as pure fractions in one process. Even components with a low concentration in the feed are recovered as a product stream with high purity and concentration.

The process concept is presented, illustrated by process simulations and validated by experiments.

A patent application has been filed for the process. Unfortunately, further details of the process can only be presented at the DECHEMA Forum after the end of the priority year, which ends in July.