

Resources Engineering Group

Professor:

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Solid-Liquid Separation (SLS) is a major unit operation that exists in almost every flow scheme related to the chemical process industries, ore beneficiation, pharmaceuticals, food or water and waste treatment. It is the most simple and the most energy efficient process among all separation processes. Our research focuses on pretreatment processes for SLS, filtration, mechanical expression, electro-forced separation, and centrifugation.

Pretreatment : flocculation, etc.

Settling or flotation : use of density difference between dispersoid & dispersion medium

Filtration : straining particles through filter media

Dewatering : squeezing solid-liquid mixture by mechanical pressure or electro kinetic force

Centrifugation : separation under centrifugal field

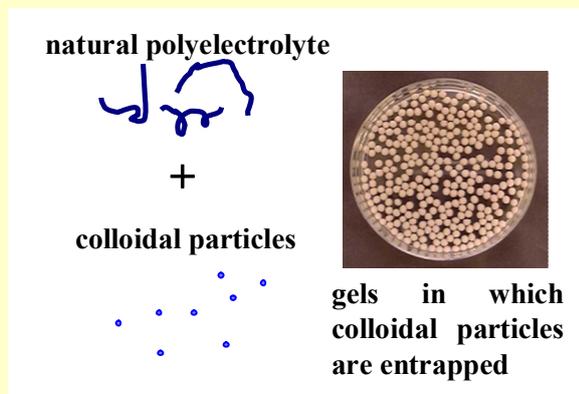
Solid-liquid separation

A novel technique utilizing particle immobilization in gels has been proposed for a pretreatment process of difficult-to-filter colloidal suspensions. A mixture of alginate aqueous solution and colloidal suspension is added dropwise to a calcium chloride aqueous solution, resulting in calcium alginate gels. Colloidal particles are immobilized in the gels. The gel suspension is deliquored gravitationally, followed by mechanical expression of the gel particles. We have investigated fundamental aspects of this technique.

Filtration can be used as a forming method of ceramic green body. We have proposed forming technique of functionally graded material by use of filtration method.

We analyzed mechanical expression under constant pressure, constant rate, and variable pressure-variable rate conditions, for obtaining rational design method of SLS equipment. We have recently reported mechanical expression and centrifugal dewatering of soft material such as hydro gel particles.

We have also elucidated the mechanism of electro-osmotic dewatering (EOD); i.e. EOD is a kind of consolidation process. EOD can be effectively combined with conventional mechanical expression (ME) . EOD-ME combined equipment can be designed well by using our theory. We currently engaged in research for remediation of metal-contaminated soil by use of electro-osmotic flow.



A new technique utilizing particle immobilization in gels , for a solid-liquid separation of difficult-to-filter colloidal suspensions.



Expression-type automatic filter press. (From Kurita Machinery Mfg. Co., Osaka. With permission.)