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Top -level research and data

Low-energy, Low resource input, Development of high-precision separation technologies aiming for low environmental

(Representative papers)

- Sorption Mechanisms of Arsenate during Coprecipitation with Ferrihydrite in Aqueous Solution
Chiharu Tokoro, Yohei Yatsugi, Hajime Koga, Shuji Owada
ENVIRONMENTAL SCIENCE & TECHNOLOGY 44 (2) 638 - 643 2010年01月
- Contact force model including the liquid-bridge force for wet-particle simulation using the discrete element method
Yuki Tsunazawa, Daiki Fujihashi, Sho Fukui, Mikio Sakai, Chiharu Tokoro
ADVANCED POWDER TECHNOLOGY 27 (2) 652 - 660 2016年03月
- Separation of cathode particles and aluminum current foil in Lithium-Ion battery by high-voltage pulsed discharge Part I: Experimental investigation
C Tokoro, Soowon Lim, K Teruya, M Kondo, K Mochidzuki, T Namihira, Y Kikuchi
Waste Management 125, 58-66 2021年4月

Keyword

- Circular economy
- Resource circulation
- Recycling technologies
- Environmental restoration technologies
- Environmental conservation technologies
- Environmental load reduction technologies
- Wastewater treatment technologies
- Resource conservation technologies
- Mineral processing
- Solid analysis
- Surface、Interface
- Powder simulation
- Geological pollution remediation

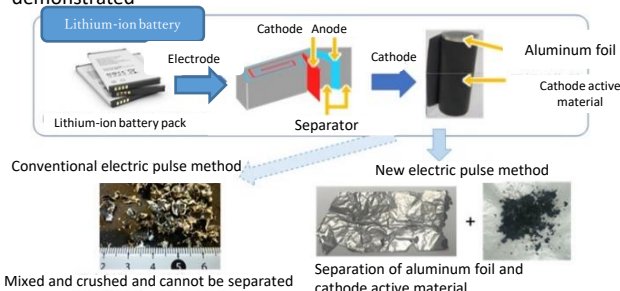
Deployment targets (sites, materials, etc.)

Ore processing, hydrometallurgy, recycling, rare metal separation, wastewater treatment, soil purification and dismantling adhesive, powder process, etc.

Features (implementation means, etc.)

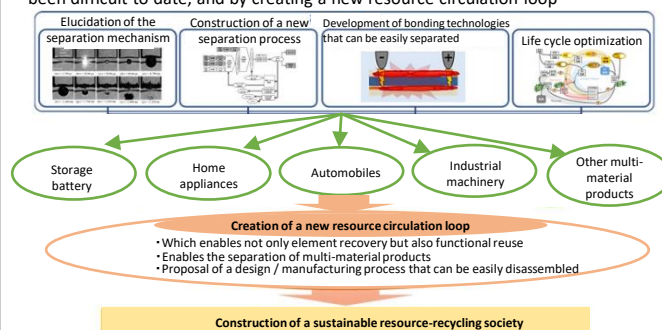
Successful separation of cathode active material from aluminum foil by employing a new electric pulse method

High-quality cathode active material could be separated without heating or chemicals, so the manufacturing process for cathode materials that can be recycled into batteries was significantly streamlined, and the potential for reducing the cost of a series of processes was demonstrated



Contribution to the realization of a resource-recycling society

Realization of a sustainable resource-recycling society that is integrated with production systems by establishing highly selective and highly efficient separation technologies for parts that are incorporated into product structures, which have been difficult to date, and by creating a new resource circulation loop



Associated proprietary technologies

•An electric pulse disassembly method using a thin wire (JP.2021-175566)

A method for dismantling objects formed by joining at least two members by placing a part of its surface in contact with a conductive material, applying a high voltage pulse to the conductive material in the atmosphere to generate a shock wave, and applying a shock wave to the joint part of the object to separate the object's members from each other.

•Establishment of a process for recycling valuable materials from waste

Proposal of a recycling process for valuables that has a low environmental impact by combining separation methods that implement various types of crushing as a pre-treatment and then utilize the physical and physicochemical properties of the target (e.g., specific gravity, electrical properties, magnetic properties, wettability, shape, color, and X-ray properties).

•Optimization of crushing and physical sorting technologies through powder simulation

Detailed understanding of the position and velocity of each particle in the device, as well as collision energy between particles and between particles and walls, by employing the discrete element method (DEM), which is a type of powder simulation.

•Sophistication of the environmental purification process

Possibility of constructing the optimal treatment process and selecting conditions according to each contamination state by employing detailed solid-state analysis techniques including XAFS, geochemical simulations incorporating surface complex models and reaction kinetics, etc. Proposals for optimal processes include adding pre-treatment by employing special crushing and sorting techniques, improving operating procedures, and reducing the amount of chemicals and sludge through metal recovery.

Expected outcome/ applications

- Creation of recycling systems with low cost and low environmental impacts
- Development of a design manufacturing process that allows for easy dismantling of dissimilar material parts in response to multi-material developments in the manufacturing industry
- Sophistication of resource / material processes

Associated SDGs

