

TOKORO LAB.

[Resource Circulation, Separation-Concentration, Powder Processing]

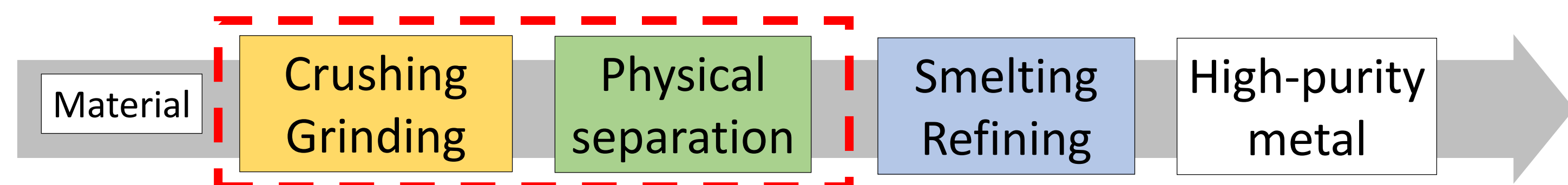
Endowed Research Unit for Non-ferrous Metal Resource Recovery Engineering
(JX Metals Endowed Unit)

Environmental Resource Processing Engineering

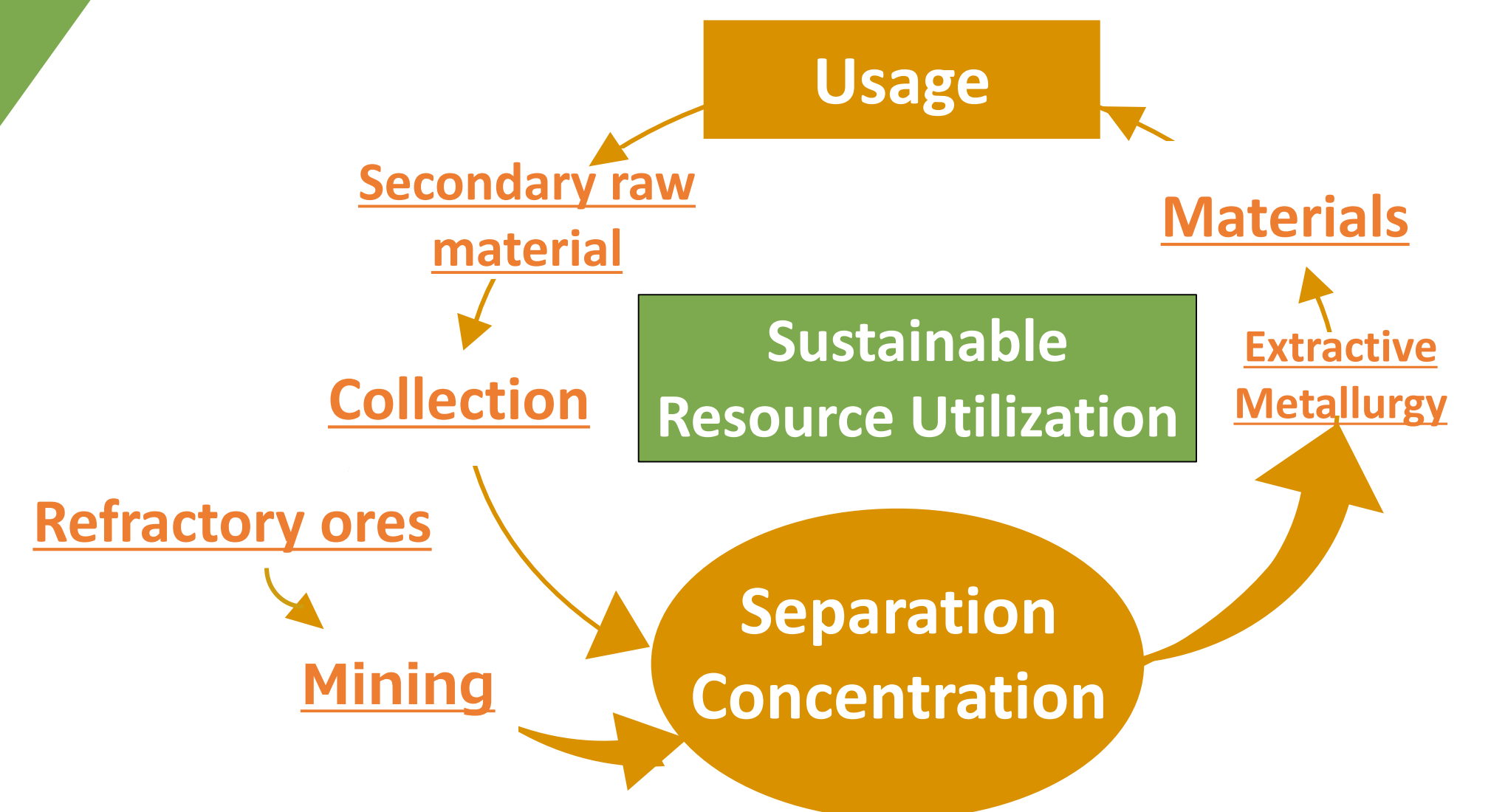
<http://www.metals-recycling.iis.u-tokyo.ac.jp/chiharutokoro.html>
<http://www.tokoro.env.waseda.ac.jp/>

Technologies for resource circulation / environmental restoration

Valorization of urban mine resources and refractory ores by advanced technologies for solid separation and concentration

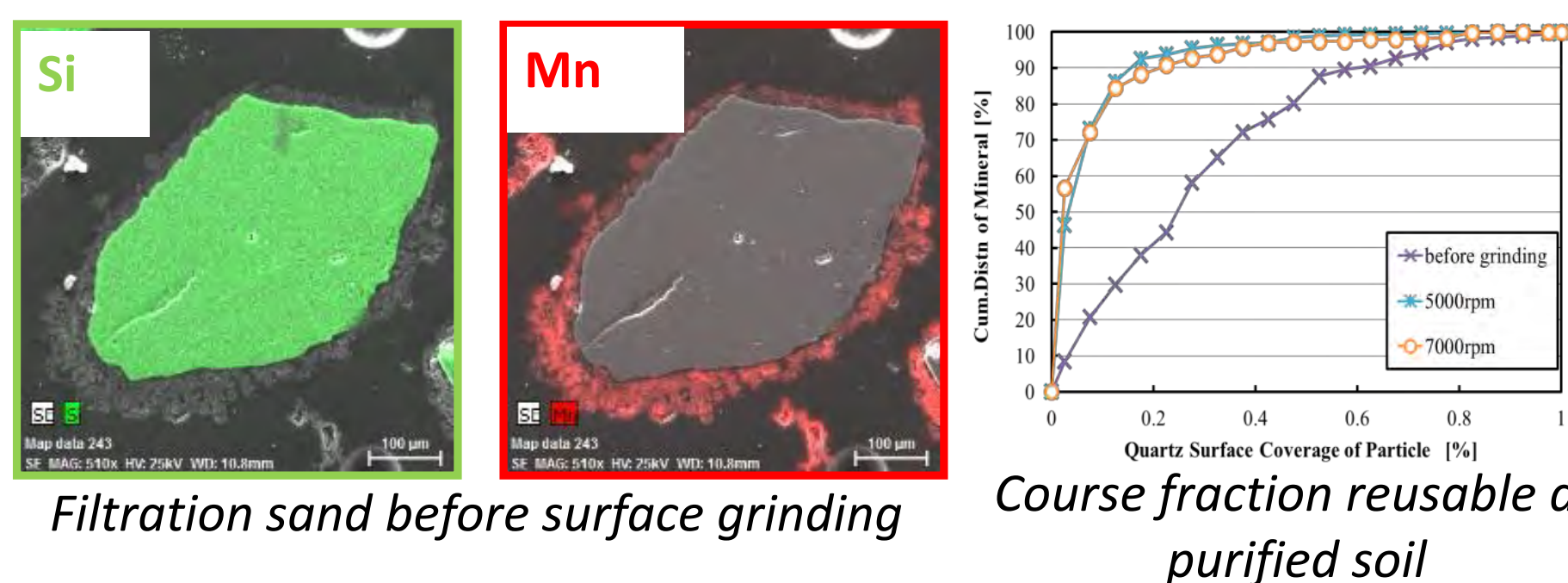


The technologies for separation and concentration of solids determine the overall process efficiency



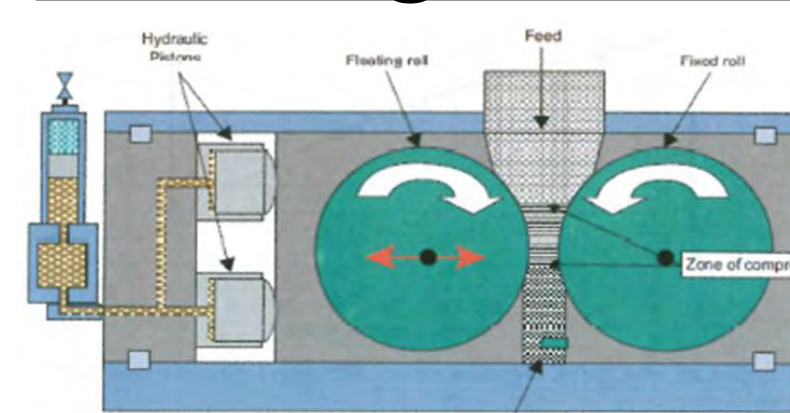
Special grinding technologies for separation of solids

Soil Remediation by surface grinding



- Increase of SiO₂ exposure by removal of surface Mn
- Concentration of Mn into a fine particle fraction

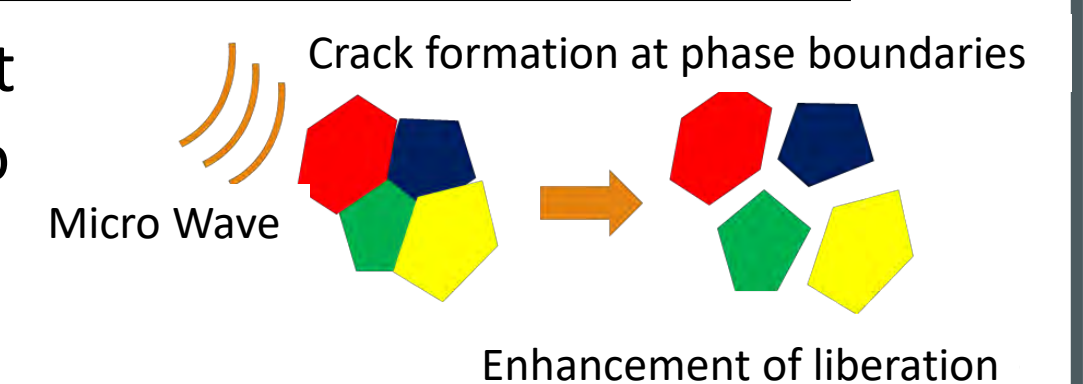
High Pressure Grinding Roller (HPGR) for selection of heterogenous minerals through boundary fracture



- Selective destruction at the interface of heterogeneous mineral phases by high compressive stress
- Separation and elucidation of fracture mechanism

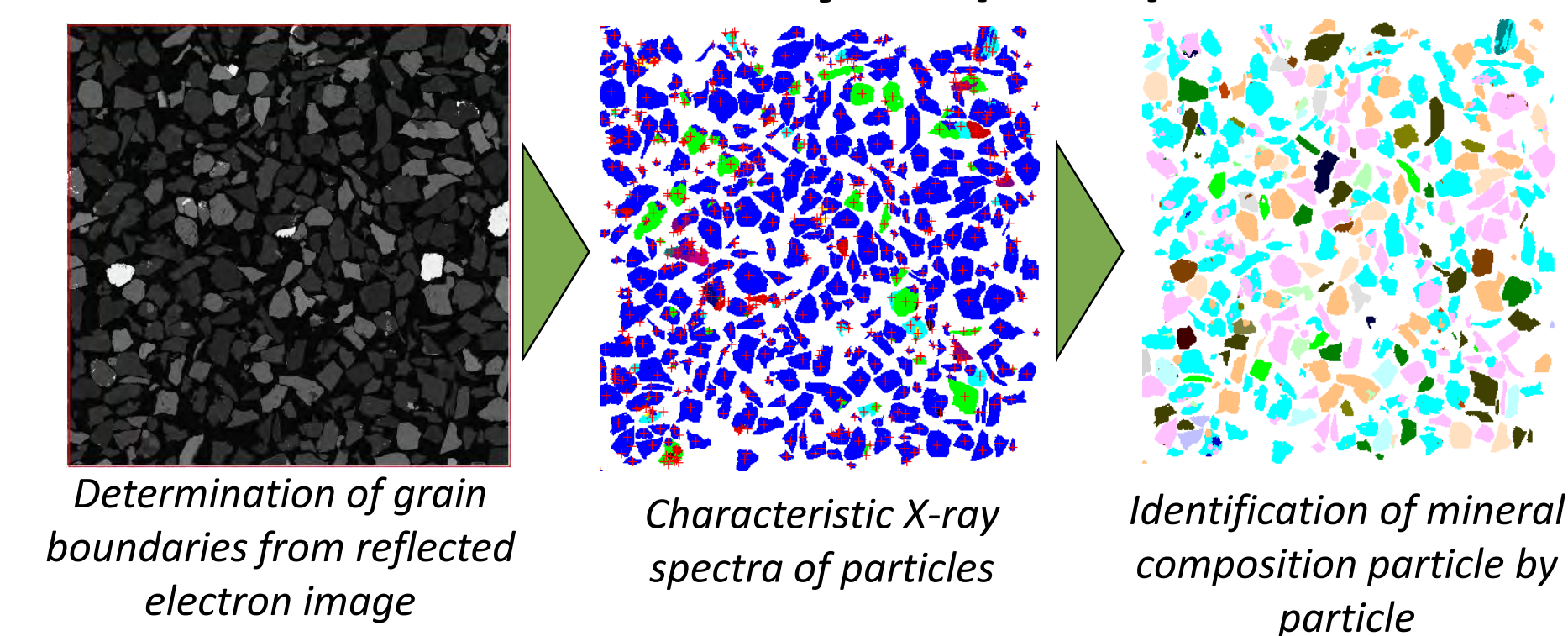
Control of mineral sorting by microwave irradiation

- Selective isolation of mineral phases by heat
- a. crack formation at phase boundaries due to different thermal expansion
- b. selective change of surface properties



Solid analysis to investigate the mineral separation

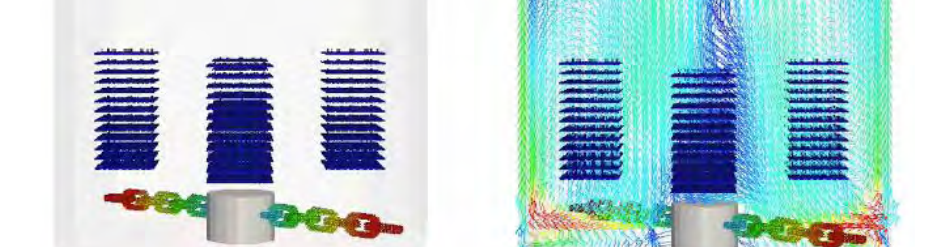
Mineral Liberation Analyzer (MLA)



- Identification of mineral phases
- Quantification of liberation degree and weight ratio of each mineral

Optimization of crushing operations by simulations

Analysis of substrate and fluid behavior in the crusher

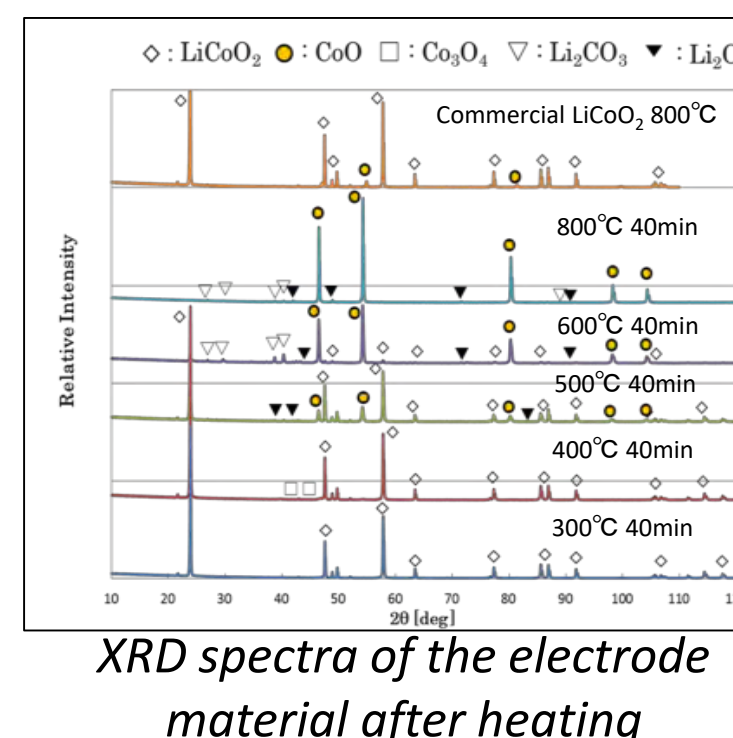
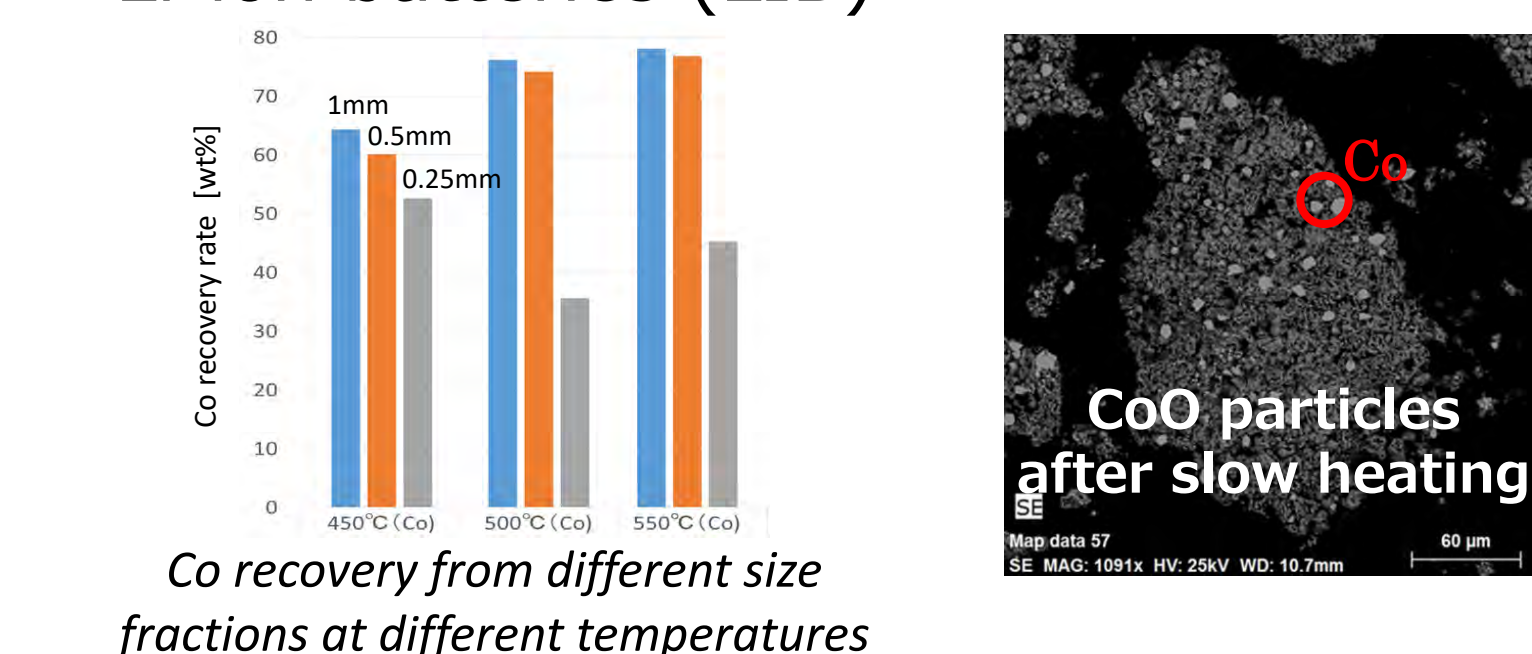


- Estimation of grinding performances by analysis of collisions between stirrer and substrate
- Possible elucidation of stirring and granulation mechanisms

Pretreatment operations for improving the solid separation

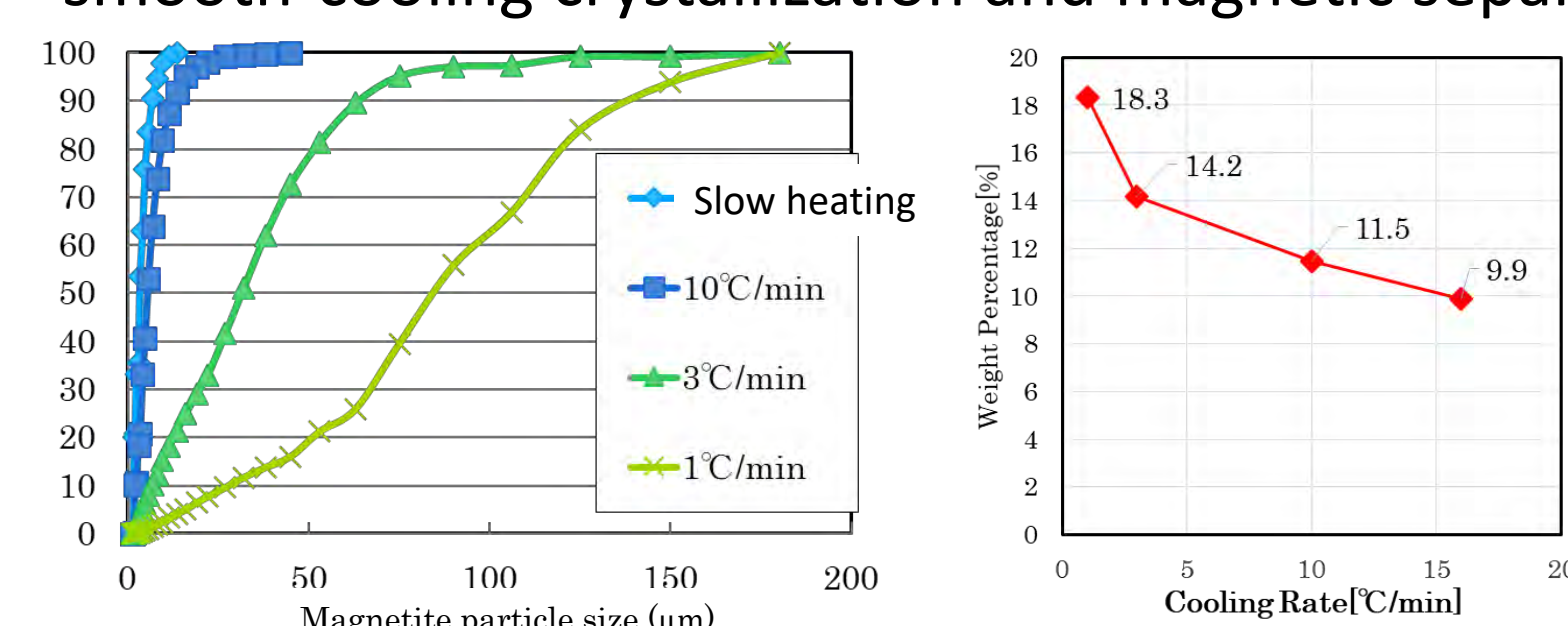
Recovery of Co from Li-Ion batteries by slow heating

- Process analysis to improve the recovery of valuable metals from Li-ion batteries (LIB)



Recovery of magnetite by slow-cooling crystallization

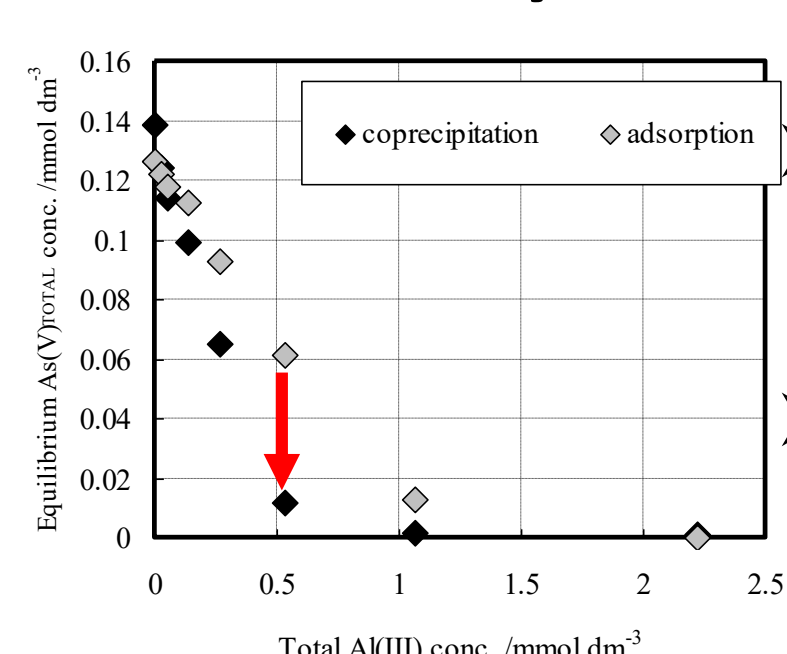
- Study of the separation of magnetite from an amorphous phase slag via smooth-cooling crystallization and magnetic separation



- magnetite particle size and precipitation rate increased by decreasing the cooling rate

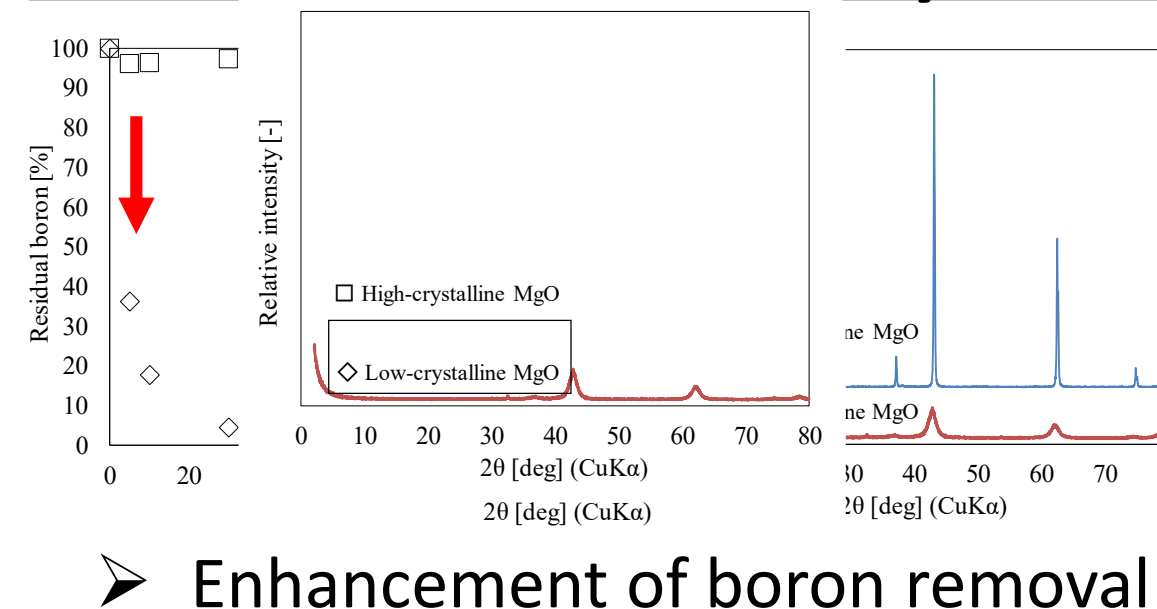
Advanced technologies for environment remediation

As removal by surface precipitation



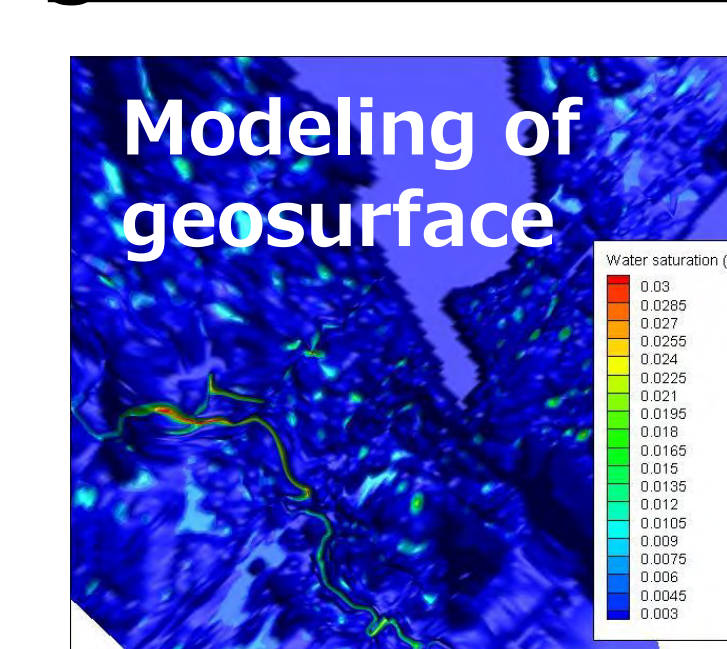
- Study and optimization of surface precipitation
- Possible recovery of inorganic elements in high efficiency

Removal enhancement by amorphization



- Calcination of MgCO₃ to MgO and quenching to suppress crystallization
- Enhancement of boron removal

Process optimization by combination of geochemical modeling and fluid analysis



- Creation of ground model from terrain data and reproduction of the dynamic shape water bodies
- Prediction of concentration profiles by considering chemical equilibria