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

**Soil Remediation by surface grinding**
- Increase of SiO₂ exposure by removal of surface Mn
- Concentration of Mn into a fine particle fraction
- Identification of the mineral phases
- Quantification of liberation degree and weight ratio of each mineral

**Mineral Liberation Analyzer (MLA)**
- Determination of grain boundaries from reflected electron image
- Characteristic X-ray spectra of particles
- Identification of mineral composition/ particle by particle

**Solid analysis to investigate the mineral separation**
- Estimation of grinding performances by analysis of collisions between stirrer and substrate
- Possible elucidation of stirring and granulation mechanisms

**Recovery of Co from Li-Ion batteries by slow heating**
- 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

**High-selective separation by novel electric pulsed charge**
- Selective separation and peeling at interface by control of voltage, current, resistance and discharge path in electric pulsed charge
- Creating a new recycling loop

**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

**Optimization of crushing operations by simulations**
- Estimation of grinding performances by analysis of collisions between stirrer and substrate
- Possible elucidation of stirring and granulation mechanisms

**Advanced Technologies for Environment Remediation**
- Study and optimization of surface precipitation
- Possible recovery of inorganic elements in high efficiency
- Enhancement of boron removal

**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

**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