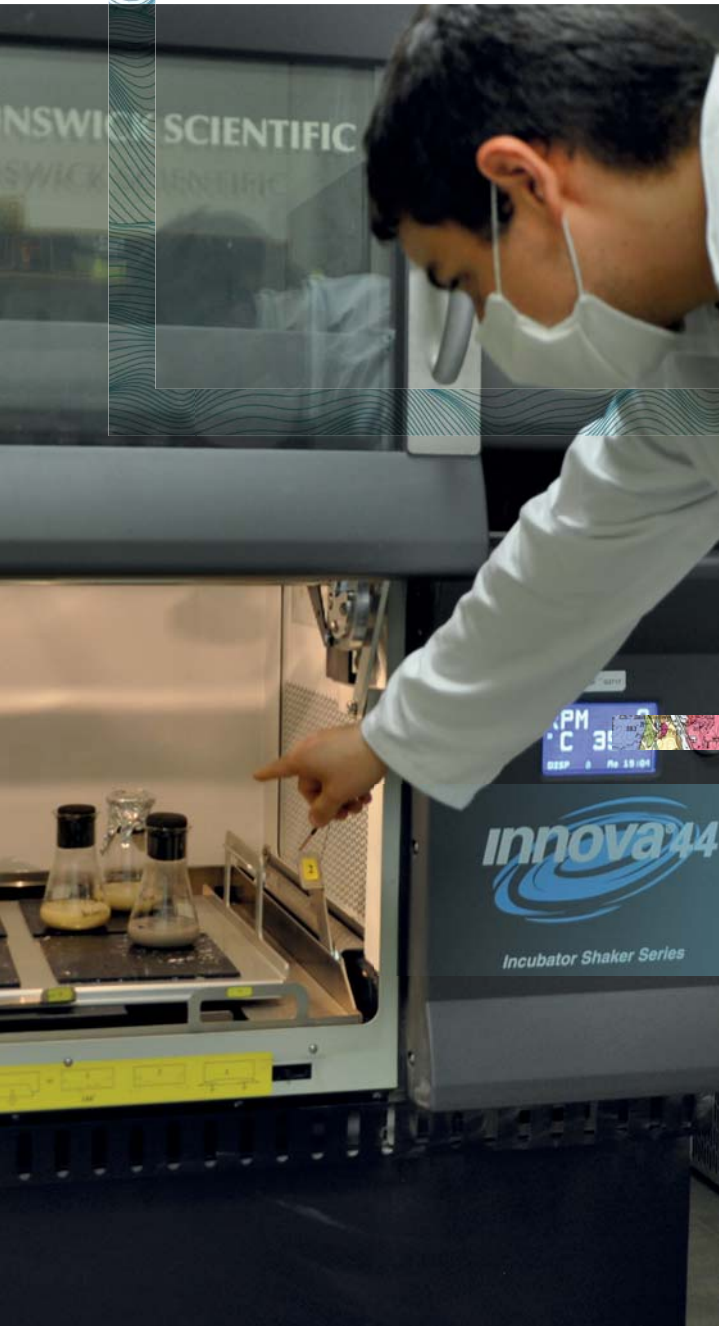




Nos SOLUTIONS

Characterisation and recovery of fine materials from industrial processes

BRGM can assist you with the characterisation and development of innovative processes for the treatment of mining and industrial fine tailings with a view to their recovery.





Cooper nugget (2017) © AdobeStock - Hischneider

YOUR ISSUES AND NEEDS

The increasing need for mineral resources (metals, industrial minerals, building materials, etc.), in a context of depleted primary deposits and the increasing complexity of exploiting them, make manufacturers increasingly dependent on their availability. At the same time, the dumping of mineral waste in landfills is increasingly regulated and costly.

However, some waste items (mining and processing residues, co-products of extractive metallurgy, recycled parts of end-of-life vehicles (ELVs), waste from electrical and electronic equipment (WEEE), etc.) are rich in mineral and metallic substances and should, in a context of a circular economy, be better characterised and treated in order to determine new ways of recovering them.

This waste contains minerals in various phases of interest, whose recovery (concentration stages) is particularly difficult. Conventional treatment techniques are increasingly less effective with fine particles (less than 100 μm), very fine particles (less than 20 μm) and ultrafine particles (less than 5 μm), and when a dry treatment process is used.

The development of innovative techniques for treating and purifying these mineral substances of interest helps to reduce the costs of landfill storage of final waste and allows them to be re-injected into industrial processes.

OUR VALUE PROPOSITION

BRGM researchers draw on their knowledge and skills for R&D work, particularly for:

- characterising the physical-chemistry of fine and ultrafine particles and the way they react to the various treatment processes,
- understanding and modelling phenomena at the interfaces between solid particles and solvents (water), and then applying the knowledge to the separation of fine particles.

This knowledge, combined with our researchers' mastery of the engineering of mineralurgical processes and first-rate technical facilities, enables them to produce recoverable fractions. BRGM can contribute to the whole cycle of operations, from the characterisation of fine materials (composition, morphology, texture, mechanical strength of mineral assemblies, thermodynamics of the dilution of metals and organic compounds within complex matrices and processes, etc.) to the design and the technical, economic and environmental assessment of recycling processes.



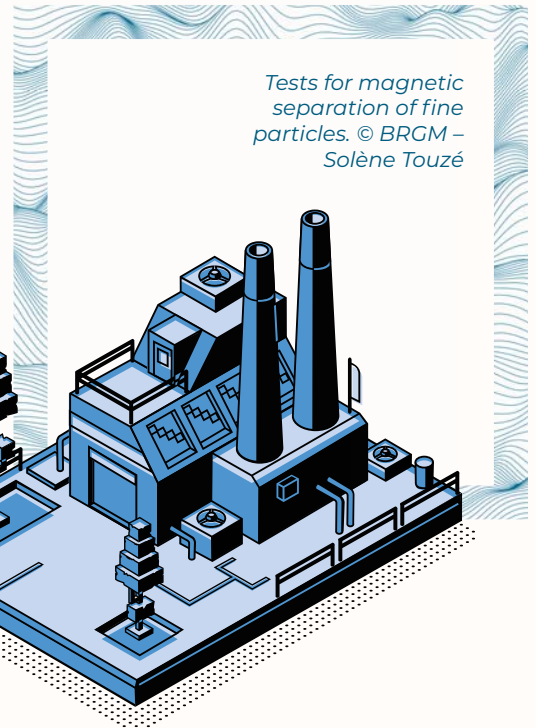
Preparation of 5 tonnes of mining waste from the copper industry for bioleaching recovery tests. © BRGM – Anne-Gwenaëlle Guézennec



Zinc-lead mineral © Adobe Stock

MEANS OF ANALYSIS AND PLATFORMS

- CARAMIN: Mineralogical and crystallographic characterization.
- CARAPHY: Mineral, physical-chemical and textural characterization.
- GENIE: numerical modelling of geochemistry.
- IN'ORGA: organic and inorganic chemical analyses (COFRAC accreditation).
- PLAT'INN: experimental platform for the treatment of mineral materials.



SOME REFERENCES OF R&D TRANSFERABLE TO COSMETIC

- Design of an experimental facility for membrane separation of nanoparticles smaller than 20 nm in size.
- Flotation of fine particles to extract rare earths in phosphates from mine tailings or in luminophores.
- Treatment of blast furnace sludge to extract carbon and iron and recycle them in steel-making processes.
- Treatment of cathode ray tube (CRT) powders from TV screens for the recovery of heavy rare earths (Y and Eu).
- Treatment of powders from the manufacture of brake pads for the recovery of non-ferrous metals (Cu, Zn).
- Treatment of unburnt products from the pyrolysis of rubber to recover zinc and carbon.
- Separation of used concrete constituents and recovery of cement paste for clinker production.
- Treatment of the fine fraction of sediments polluted by metals and hydrocarbons.



BRGM's Plat'Inn platform for raw materials and the circular economy (Orléans, 2020) © BRGM- Didier Depoorter



EDUCATION & TRAINING,
one of BRGM's missions

BRGM helps to develop scientific and technical skills through both "off-the-shelf" and "tailor-made" training courses, provided by its specific professional training branch: BRGM Formation.

Training course themes :

Geology | Sustainable management of groundwater resources | Mineral resources and circular economy | Environment, land-use projects | Energy transition and underground space | Natural risks, impacts of climate change.



Geoscience for a sustainable Earth

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