Trace Metals for a Healthy Economy

Helmholtz Institute Freiberg for Resource Technology

HELMHOLTZ ZENTRUM DRESDEN ROSSENDORF

BERGAKADEMIE FREIBERG · TECHNISCHE UNIVERSITÄT

“In principle, there are enough high tech metals. The trick is to make them available.”

Cerium, gallium, germanium, indium, lanthanum, yttrium – the list of speciality metals is long which are needed to produce components for energy saving lamps, solar cells, mobile phones, flat screen TVs, computers, and other technically sophisticated products. Actually, these high tech metals are available in sufficient quantities around the globe. But the increasing demand coming especially from emerging and developing countries, the unequal distribution of natural resources, and the decreasing quality of these resources all threaten the stability of their supply. Germany, a high tech country, has to come up with a sustainable concept to supply its industry with these economically important strategic resources. That’s why the German Federal Government established the Helmholtz Institute Freiberg for Resource Technology (HIF) in 2011 – as a joint institution of the research center Helmholtz-Zentrum Dresden-Rossendorf and the TU Bergakademie Freiberg. HIF makes a valuable contribution towards the national raw materials strategy.

Prof. Jens Gutzmer,
Director of the Helmholtz Institute Freiberg
for Resource Technology

Cassiterite, which every miner knows, is still considered to be an important mineral today. It often contains niobium and tantalum, even if they’re only found in small quantities. Title page: Crystal aggregate of chalcopyrite, galenite, sphalerite, and calcite. It contains indium, germanium, and silver. Place of discovery: The Rhodope Mountains, Bulgaria.

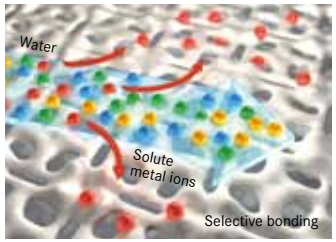
“We develop new technologies to make high tech metals available. We’re also educating the technologists together with the TU Bergakademie Freiberg.”

When it comes to new technologies designed to supply strategic resources to the economy, the Helmholtz Institute Freiberg sets very high standards. The task can only be solved if we manage to secure a stable supply of high tech metals against the backdrop of the challenging situation of global raw materials supply. That’s why we’re not only looking for ways to use the global deposits better. We’re also looking for these metals at our own doorsteps: In the tailings dams of old mines, in scrapyards, and even on the street – and we’re developing the technologies that harness them more effectively despite their low concentration. This creates twice the benefits: Our resource technologies are “Made in Germany”, which is why we trust that they will find acceptance in the global resource industry. And these new technologies also call for new technologists and scientists. We’re training and educating them together with TU Bergakademie Freiberg.

When it comes to strategic resources for the economy, abandoned mines can harbor real treasures. In order to extract them in an economically viable manner, we’re also using the training and research mine managed by the TU Bergakademie Freiberg.

“Extracting, processing, refining, and recycling. We conduct research at the long end of the value chain.”

Developing new resource technologies means breaking new ground in exploration, extraction, processing, refining, and recycling. The Helmholtz Institute Freiberg focuses its research competence primarily on the last steps of this chain. How can high tech metals, which often only exist in low concentrations and which are finely dispersed, be separated in an economically viable manner from the natural ores they are bound in? What metallurgical processes are needed to subsequently refine the extracted materials at an industrial scale? How can the coveted materials be removed efficiently from old energy saving lamps, monitors, or even street dust? How can these materials be recovered from waste and wastewater which accumulate during manufacturing processes? And, finally: How can we ensure that some raw materials only flow into specific products in either small quantities or not at all?



The biosorption principle: Bacterial envelope proteins selectively bind the metals found in minerals.

Bacteria could be used in the future to solve the problems that occur during the processing of certain ores. The geobiotechnology lab at the Helmholtz-Zentrum Dresden-Rossendorf.

“With our research, we sometimes enter unknown territories. This is only possible with strong partners and a unique infrastructure.”

The Helmholtz Institute Freiberg (HIF) has access to laboratories and technical facilities which cover the entire range of methods and technologies needed for the processing and metallurgical treatment of strategic resources – both at a lab and at a pilot plant scale. An unparalleled equipment pool, which includes a field emission electron microprobe and a mineral liberation analyzer, helps investigate minerals. Together with the Helmholtz-Zentrum Dresden-Rossendorf’s Ion Beam Center, HIF is developing ultrasensitive chemical and isotopic analysis procedures. The HZDR’s radiochemistry and biotechnology labs help investigate novel bioleaching technologies. However, research related to mineral and metalliferous resources also means being close to the mines. The Helmholtz Institute Freiberg can go underground literally around the corner – in Europe’s only training and research mine, where new extraction and processing technologies are tested under real life conditions to determine their effectiveness.

It takes pioneering metallurgical work to refine technology metals until they are ready for use. Freiberg’s IsaSmelt pilot plant is unique among universities around the globe.

“Research results which are to be applied in industry require teamwork. You’re cordially invited to join us – for your own benefit.”

The most important partners of the Helmholtz Institute Freiberg are located in the immediate vicinity: The TU Bergakademie Freiberg, the world’s oldest university of mining, and the Helmholtz-Zentrum Dresden-Rossendorf. Both not only support us with their top-notch scientific expertise – they also provide the geoscientists, natural scientists, and engineers who assist and advance our R&D efforts. Close contacts, particularly when it comes to assessing the economic efficiency, also exist with the German Mineral Resources Agency (DERA). In addition, close ties to other universities, non-university research institutions, German and European entities and authorities addressing raw material policies as well as national and international companies from the raw material branches all help to quickly transfer research results into industry. If you’re looking for a way to explore high tech metals from a specific source: Please don’t hesitate to contact us!

New resource technologies are needed here.
How do we retrieve the valuable high tech metals from our electronic scrap?

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