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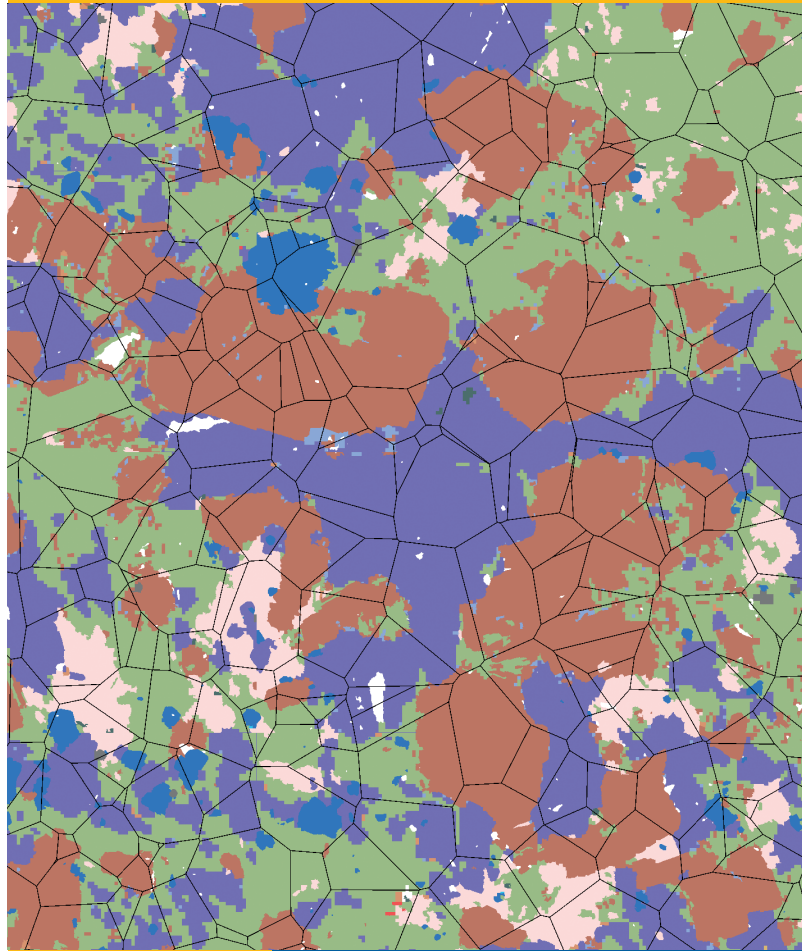k.van-den-boogaart@hzdr.de

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Added value from ore by means of adaptive processing

Helmholtz Institute Freiberg for Resource Technology
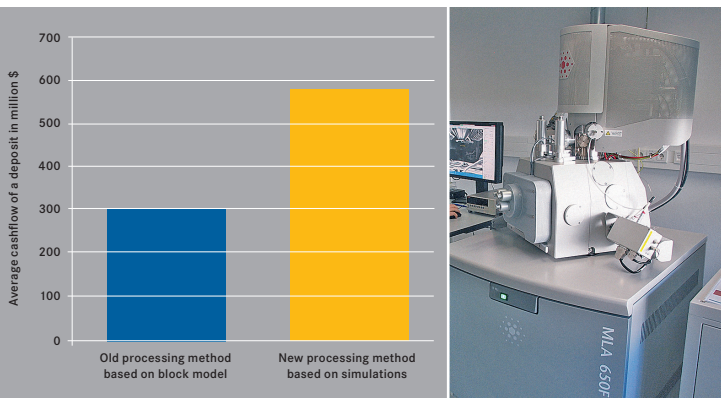
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Non-adaptive processing

Mining is one of the most material- and cost-intensive industries. Since the metal content of available ores is nowadays often minute, vast quantities of rock must first be mined. The blocks of ore are crushed and processed on site – usually each block in the same way. However, this does not take into account the individual composition and microstructure of the raw material; more metal could be extracted by adaptive processing.

The raw materials modelling performed by the researchers at the Helmholtz Institute Freiberg for Resource Technology (HIF) can be used for this very purpose. Optimal adaptive processing shows how to exploit the full value of future mines and how to operate them more flexibly. It helps to plan investments more accurately and replace rule-of-thumb-decisions by rigorous valuation. Apart from technical and geological factors, political, social, environmental and other uncertainties are taken into consideration.

Left: Stochastic adaptive processing optimization. Diagram according to: R. Tolosana-Delgado, U. Mueller, K. G. van den Boogaart, C. Ward, J. Gutzmer: Improving processing by adaption to conditional geostatistical simulation of block compositions, The Journal of the Southern African Institute of Mining and Metallurgy 115(2015), 13-26. Right: The HIF research team analyze the microstructure of ores using automated mineralogy. The results determine the right choice for adaptive processing and can lead to significantly higher yields from a deposit. Picture credits: HZDR.

Resource-efficient and economical

How is it possible to increase the yield from ore? It can be done with flexible control of systems and processes. The questions that have to be asked are, for example: Which part of the raw material is used? How fine is the ore to be ground? Which ores are to be processed together? Stochastic adaptive processing optimization provides the answers.

The HIF researchers use the approach of geometallurgy: They combine petrographic methods of analysis and mathematical models with the aim of making accurate predictions for extraction and for the metallurgical processing of resources. This means that deposits can be precisely described, systems operated optimally and raw materials sourced in the best possible way.

Depending on the type of ore-bearing rock, the value of the raw ore can typically be increased substantially by means of adaptive processing. In the future, complex ores previously regarded as unmineable could also be economically exploited. This approach is explored for instance in a collaborative project on the processing of complex ores [Aufbereitung von Komplexerzen] funded by the German Federal Ministry of Education and Research. Project partners are from industry (Beak Consultants, Saxore Bergbau, Tin International, UVR-FIA GmbH) and science (RWTH Aachen University, TU Bergakademie Freiberg).

Our strengths

// We use automated mineralogy (MLA, Quemscan) and other instruments to precisely describe raw materials and deposits on the basis of individual ore particles.

// We combine this information with a variety of other factors that can be crucial to the mining of new deposits. This allows for comprehensive modelling of raw materials.

// We can predict the geometallurgical properties of deposits in detail. For this purpose, we use innovative non-linear geostatistical simulation methods which take account of both formation processes and measured data.

Interested in working with us? Get in touch!