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Beyond conventional geometallurgy: a broader view to be prepared for a circular economy

Orebody knowledge is foundational to geometallurgy in which the focus has changed from the well-known traditional geometallurgy to one integrating a broader view towards the global transition into low-carbon technologies and economy, with the potential to unlock future unknown resources. Optimization of the known, for example, a copper resource from a porphyry copper deposit, is now extended to the optimization of not only the copper product but other valuable elements present in ore and non-ore materials and/or potential products sourced from non-ore materials and tailings (construction materials, concentrates via reprocessing, etc.) These optimization and de-risking processes are related to the mining value chain which now would be viewed as a value circle or wheel rather than a chain since we have the potential to produce new materials from residual products.

Complex orebodies in which ore and non-ore materials are considered, need enhanced orebody knowledge to unlock future resources by identifying, assessing, and testing the economic value using advanced analytical techniques such as applied mineralogy, chemical analytical methods, novel core scanning and microanalytical tools, and novel mineral processing techniques. The microanalytical tools are of particular significance because the scale of characterization is relevant as some economic elements can occur in different minerals. Therefore, a routine chemical assay will not provide information on its occurrence, the analytical packages used routinely do not include some critical elements (e.g. REE) or have inappropriate lower detection limits.

Data collection through orebody knowledge initiatives need to be combined with other data and tests via data integration to make geometallurgy successful. Integration can be accomplished by advanced tools such as machine learning and to do this, a team validation is needed to ensure that geological, processing, mining, and/or environmental aspects, are appropriate and will be embedded in current and future geometallurgical models or reclamation activities.

Regina Baumgartner

Regina holds a PhD of University of Geneva, Switzerland. She has experience working in greenfields exploration projects, brownfields exploration, advanced projects and operations.

She worked for Gold Fields for over eight years as a principal geoscientist focusing on geometallurgy of advanced projects of base metal porphyry deposits and precious metal epithermal in Peru, the Philippines, Chile, Mali, among others. She was also part of the Geomet team at an operation in Peru for over four years. At Teck, she worked in Greenfields and advanced projects as a principal geologist overlooking the Quebrada Blanca 3 project in Chile, focusing on geoscience and geometallurgical initiatives. Since January 2021, she is the Group Leader, Applied Mineralogy and Geoscience in the Technical Services Group in Trail, Canada. In her free time, she is an adjunct professor at Pontificia Universidad Católica del Peru (PUCP) giving lectures and supervising honors students.