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Special Issue Reprint

Using Mineral Chemistry to Characterize Ore-Forming Processes

Edited by: Xinlu Hu , Xinbiao Lv , Yafei Wu and Zhenjie Zhang

An ore deposit is an aggregate of minerals that can be economically recoverable and utilized. Ore minerals and gangue minerals are products of ore-forming processes and indicators of ore genesis. The radioisotopes of minerals can provide insights into the ages of mineralization. The stable isotopes of minerals can indicate the nature and origin of ore metals and fluids. The chemical composition of minerals can reflect the original composition and evolution of ore fluids. Combined with the texture, generation, and paragenetic association of minerals, the ore-forming processes can be well constrained. This Special Issue is intended to present mineralogical, geochemical, isotopic, and geochronological studies aiming at constraining the ore-forming processes and mechanisms of various types of mineral deposits. This Special Issue brings together nine studies that employ mineral-based investigations to advance the understanding of ore-forming processes. The contributions demonstrate how integrated approaches combining microtextural analysis, in-situ geochemistry, and isotopic systems can unravel complex mineralization processes across diverse geological settings. These studies successfully trace fluid evolution pathways, constrain metal sources, determine precise mineralization ages, and reveal petrogenetic processes controlling metal endowment. The findings demonstrate how mineral-scale signatures can reveal large-scale geological processes, from crust–mantle interactions in magmatic systems to fluid–rock reactions in hydrothermal environments.

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