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Selenium and molybdenum enrichment in uranium roll-front deposits of Wyoming and Colorado, USA

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Highlights

- Sampled roll-fronts show notable concentrations of Se and Mo, and depletion of Te.
- Mo-Se-U are likely sourced from granite intrusions, tuffaceous deposits, and pyritic mudstones.
- Se is high in redox front zone, while Mo concentrates in the nose and seepage zones.
- Consistent distribution of Mo-Se-U is due to differing Eh capacities and microbial activity.
- Concentrations should be monitored during processing due to contamination effects.

ABSTRACT

Sandstone uranium (U) roll-front deposits of Wyoming and Colorado (USA) are important U resources, and may provide a terrestrial source for critical accessory elements, such as selenium (Se), molybdenum (Mo), and tellurium (Te). Due to their associated toxicity, Mo-Se-Te occurrences in roll-fronts should also be carefully monitored during U leaching and ore processing. While elevated Mo-Se concentrations in roll-fronts are well established, very little is known about Te occurrence in such deposits. This study aims to establish Mo-Se-Te concentrations in Wyoming and Colorado roll-fronts, and assess the significance of these deposits in an environmental and mineral exploration context.

Sampled roll-front deposits, produced by oxidized groundwater transportation through a sandstone, show high Mo-Se content in specific redox zones, and low Te, relative to crustal means. High Se concentrations (up to 168 ppm) are restricted to a narrow band of alteration at the redox front. High Mo content (up to 115 ppm) is typically associated with the reduced mineralized nose and seepage zones of the roll-front, ahead of the U orebody. Elevated trace element concentrations are likely sourced from proximal granitic intrusions, tuffaceous deposits, and local pyritic mudstones.