

Micas, Metamorphism and Critical Element Enrichment

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The process(es) involved in critical metal (e.g. Li, Cs, Ta, Sn & W) enrichment in granitic magmas has long been a matter of discussion: fractional crystallisation from typical parental magmas is incapable of producing the observed enrichment on its own. Potential alternative enrichment processes include prograde metamorphism, partial melting and assimilation of pre-enriched protoliths. Currently unknown is the relative importance of any enrichment in the original protolith versus the concentrating potential of sub- and supra-solidus metamorphic reactions. Comprehensive concentration datasets of elements of economic interest in different metamorphic minerals are also currently lacking. We present the first large-scale dataset of *in-situ* LA-ICP-MS trace-element data of Li, Cs, Ta, Sn & W in metapelite-hosted muscovite and biotite from three different metamorphic cross-sections covering sub-greenschist to granulite-facies conditions. Our data show distinctive concentration changes during metamorphism that are seemingly independent of geological/tectonic setting (continental collision vs. crustal thinning). Our dataset confirms the previously predicted pre-enrichment potential of metamorphic reactions and the importance of studying such processes to constrain the formation of crust-sourced critical metal deposits.