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Trace element characterization of natural graphite samples by LA-ICP-MS

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Graphite is on the 2022 USGS critical minerals list because it is the main anode material in Li-ion batteries, making it critical for the transition to green energy. The physical and chemical composition of graphite used in Li-ion batteries has been shown to affect battery performance [1]. While both synthetic or natural graphite can be used, the latter is cheaper and less energy intensive to produce. However, the geological controls on the physical and chemical properties of natural graphite remain poorly understood. This study will present results from *in-situ* Laser Ablation Inductively Coupled Plasma Mass Spectrometry (LA-ICP-MS) analysis of graphite from a variety of global geological settings to assess the presence, concentration, and variability of trace element constituents and micro-scale mineral inclusions. The LA-ICP-MS analytical technique allows for the analysis of most elements in the periodic table and a list of 60 elements is assessed for this sample set with levels of detection ranging from single parts per million for some lighter elements down to single ppb for rare earth elements (REE) and U. Analytical challenges encountered include lack of matrix-matched reference materials, poor ablation yield and choice of internal standard element for quantification. Systematic differences between graphite deposits can be seen for many elements including Si, S, V, Fe, Y, REE, and U. The results of this study will be used to better understand element substitutions in graphite with respect to geologic processes and to characterize this critical material for advancing the understanding of green energy resources.

References:

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