

From rock to resource: the potential of Raman spectroscopy for the traceability of natural graphite sources

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The global transition to green energy in order to combat climate change has led to a significant increase in demand for critical metals, minerals, and raw materials, which are essential for renewable and clean energy technologies. Natural graphite is one of these materials and has become a crucial element, particularly due to its use in electric vehicle batteries. As graphite demand increases, ensuring its traceability is essential for promoting responsible sourcing and sustainable practices throughout the supply chain.

In this study, part of the European Graphite project, we focus on using Raman spectroscopy to develop methods for tracing and identifying different types of natural graphite. Graphite can form in various geological settings and under different grades of metamorphism; distinguishing between these types is essential. By examining graphite from various geological areas with different metamorphic gradients, we demonstrate how Raman spectroscopy can differentiate between types of natural graphite.

Our samples were collected from the ZVG Ukrainian mine, the Pyrenean and Alpine belts, representing a range of different temperature and pressure conditions. This allows us to analyze Raman parameters to determine the best ones for traceability. Among these parameters, we considered the band shapes, intensity ratios of the bands and the distances between the different bands composing the Raman spectra of natural graphite.

This knowledge is essential to identify key locations where high-quality graphite can be sourced, to ensure its traceability and to support sustainable supply chains for the energy transition.