

REE analysis of fluorite from the Illinois-Kentucky Fluorspar District

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The Illinois-Kentucky Fluorspar District (IKFD) located in the northern New Madrid Rift Zone is a fluoritic MVT deposit with minor Pb-Zn mineralization. In the district are Permian ultramafic and lamprophyre dikes, pipes, and diatremes; Hicks Dome (HD), a crypto-explosion structure formed by the release of magmatic volatiles from a carbonatite complex with elevated REE content; and the Coefield Intrusive Complex, a magnetic high with REE-bearing perovskite alnöite[1]. Decreasing fluid inclusion temperatures and changes in fluorite chemistry from HD to the fringes of the district can be interpreted as magmatic input from HD into a regional MVT system, and previous studies support a model for magmatic gases lowering fluid pH, supplying fluorine, and brecciating host rocks. We analysed the REE and selected trace element chemistry of 270 fluorite grains from 32 locations across the IKFD using LA-ICP-MS, including early- and later-forming fluorite derived from the paragenetic sequence. REE concentrations are uniformly low, typically 10^{-2-0} ppm. There are two typical patterns of REE.

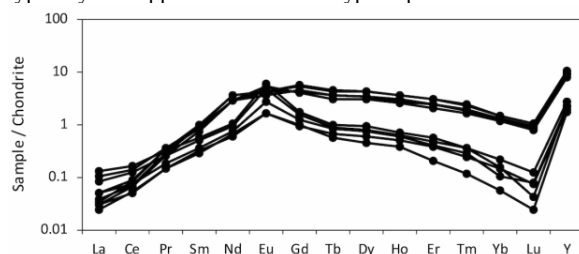


Figure 1: REE patterns of early (upper patterns) and later (lower patterns) fluorite from the Hill Mine, Illinois. Early fluorite can have a small positive Gd anomaly.

Fluorite REE patterns are not similar to fluorite from a mineralized fracture within the ultramafic Sparks Hill diatreme nor to whole rock patterns of intrusive rocks within the IKFD. Our data suggest little input of magmatic fluid into the regional MVT system.

[1] Anderson (2019) *KY Geol Survey Report of Investigations* 8 doi.org/10.13023/kgs.ri08.13.