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Rare Earth Element Mineralization in the Dongpao Deposit, Tamduong, North Vietnam

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Dongpao is a giant rare earth element (REE) deposit in Vietnam, which is enriched by hydrothermal processes; it encompasses vein-type REE mineralization in syenite and carbonatite. The primary REE-bearing mineral in this deposit is bastnäsite, along with minor occurrences of parisite, monazite, and xenotime. REE mineralization took place during the later stages of hydrothermal activity, followed by a sulfide phase. Barite and fluorite are the principal gangue minerals associated with REEs. Ore samples from the carbonatite and vein-type ores exhibit high REE concentrations, ranging from 9,122 to 15,048 ppm and 39,700 to 131,188 ppm, respectively. The geological context and petrological attributes of the Dongpao deposit suggest that two primary factors contributed to REE enrichment: (1) fractures that facilitated the circulation of ore-forming fluids and provided space for REE precipitation and (2) the substantial presence of fluorite and barite in the ore, resulting in elevated concentrations of F^- and SO_4^{2-} ions in the ore-forming fluids, which promoted the transport and deposition of REEs.