

## Mineralogy, Age, and Fluid Geochemistry of the Rila Emerald Deposit, Bulgaria

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### Abstract

Gem-quality emerald is found within granitic pegmatites cutting talc schists in the western Rhodopa massif in southwestern Bulgaria. The  $^{40}\text{Ar}/^{39}\text{Ar}$  data for phlogopite from emerald-bearing phlogopite schist yield a plateau age of  $34.2 \pm 0.4$  Ma, which indicates the emplacement of the pegmatite during late Alpine orogenesis. Emerald crystals form within the metasomatic zone near the contacts between altered pegmatite and talc schists. Oxygen and hydrogen isotope analyses of emerald ( $\delta^{18}\text{O} = 9.4\text{‰}$ ,  $\delta\text{D} = -29.8$  to  $-32.7\text{‰}$ ), combined with fluid inclusion study, indicate that a single stage of a homogeneous fluid (in the system  $\text{H}_2\text{O}-\text{CO}_2-\text{NaCl}$ ) of metamorphic origin produced the pegmatite-talc schists hydrothermal alteration at temperatures between  $300^\circ$  and  $400^\circ\text{C}$ .