

REE AND STABLE ISOTOPE STUDY ON CALCITE AND GYPSUM FROM AMETHYST GEODES OF THE SERRA GERAL (ALTO URUGUAI, BRAZIL)

1GILG, H. A., 1MORTEANI, G. and 2STRIEDER, A. J. 1Technische Universität München, Garching, Germany; 2Universidade Federal do Rio Grande do Sul, Porto Alegre, Brazil

We investigated carbonate and sulfate minerals in amethyst geodes hosted by lavas of the Lower Cretaceous Serra Geral Formation, Rio Grande do Sul, Brazil. The geodes display a characteristic zoning. An outer rim of celadonite, pyrite and early calcite is followed by the deposition of agate, colorless quartz, amethyst and late calcite, zeolites and/or gypsum crystals. Oxygen isotope compositions of early and late stage calcites from all ten investigated deposits are very homogeneous (24.9 ± 1.1 permil relative to SMOW, $n=34$). These values indicate a single aqueous fluid source and relatively constant and low temperatures (50°C) during geode filling. In contrast, carbon isotope values of calcites show considerable variations between and within deposits of more than 15 permil. The data indicate a local and in some areas more than one source of carbon in the fluid. Sulfur and oxygen isotope data of late stage gypsum are consistent with a derivation of sulfur by oxidation of pyrite from the Serra Geral volcanics under anaerobic to slightly aerobic conditions. The REE contents of calcites in the geodes are extremely variable in contrast to the host lavas. Most calcites show a continuous decrease in normalized REE content from LREE to HREE and have either a marked negative Eu or Ce anomaly or none indicating variable redox conditions. Other calcites display flat patterns or increased HREE contents which are interpreted as a result of remobilization of earlier carbonates. The REE contents of gypsum are in most cases below 0.01 times the chondritic ratio.