

Sr and Nd isotope data from the fluor spar district of Asturias, northern Spain

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Abstract

The origin and age of the hydrothermal fluids related to the precipitation of fluorite, barite and calcite in the Villabona, La Collada and Berbes localities (Asturias fluor spar district, N Spain) have been evaluated from Sr and Nd radiogenic isotopes. Sr isotope data ($^{87}\text{Sr}/^{86}\text{Sr}=0.7081$ to 0.7096) are compatible with mixing between seawater and a more evolved groundwater that interacted with the basement. From Nd isotopes in fluorite, an isochron age of 185 ± 29 Ma (Lower Jurassic) was obtained, consistent with other hydrothermal events in the Iberian Peninsula and Europe. These constraints are essential to proceed with a quantitative model for the genesis of the mineralization that includes fluid and heat flow together with reactive transport of solutes. © 2006 Elsevier B.V. All rights reserved.

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1. Introduction

The Asturian fluor spar district (N Spain) is one of the most important in Europe. Some of the deposits in the Villabona, La Collada, and Berbes-Caravia subdistricts are currently in operation. They appear as veins cross-cutting the Paleozoic basement, and ‘mantos’ along the Paleozoic–Triassic unconformity, replacing a tectonic breccia. The paragenetic sequence is composed by quartz, fluorite (one generation; from yellow, uncolored to deep purple), barite, calcite, and late sulfides. Fluorite is more abundant towards the centre and west of the district, while barite predominates towards the

east. Coincidentally, there is a decrease in the homogenization temperatures of fluid inclusions in fluorite and quartz from the east and central areas, that is the Caravia-Berbes and La Collada subdistricts, to the west or Villabona subdistrict (García Iglesias and Loredó, 1994; Sánchez et al., 2005). Up to now, no data about the age of the deposits was available although geological constraints suggested they could form at any time from Permian to Lower Jurassic.

Similar mineralization is found in the northeast of the Iberian Peninsula (Pyrenees and Catalan Coastal Ranges); it had presumably formed from Upper Triassic to Middle Jurassic (Canals and Cardellach, 1993). Hydrothermal events of Permian age have also been identified in the central part of Spain (Central System) by Tornos et al. (2000) and Martín-Crespo et al. (2004). Therefore, the time period from Permo-Triassic to

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