Genesis of Scheelite-Bearing Calcsilicate Gneisses in the Tanneron Massif (Var, France)

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Abstract

The Tanneron gneissic massif (Var department, SE France) contains calcsilicate gneiss lenses, some with scheelite mineralization. Mineralized and barren lenses have been sampled in the abandoned La Favière tungsten mine (10 km W of Cannes). They are made up of concentric zones, namely a muscovite-free gneiss outer shell, a barren pyroxene gneiss zone, a mineralized pyroxene band and in places a marble core. Bulk rock and microprobe analyses have been made on each zone. The bulk rock geochemistry of the barren zones can be explained by isochemical transformation of a mixed limestone-greywacke protolith. On the other hand, because of their low Ti content, the scheelite-bearing zones are interpreted as metasomatized marble. Field observations and pyroxene, plagioclase and biotite compositions suggest that both mineralized and barren zones, at least partly, formed by infiltration metasomatism as products of a metasomatic column established at the marble-gneiss contact. Metasomatism is distinct from and post-dated the metamorphic formation of barren calcsilicate gneiss. It involved fluids with high W, F and Cl activity.

1 Introduction

Calcsilicate gneiss (CSG) lenses are widespread in the Tanneron Massif, SE France (10 km W of Cannes). Some of them have tungsten mineralization. They were mined from 1982 to 1986 in the La Favière scheelite deposit which during these 4 years yielded 150 000 tonnes at 1 wt% WO3. The workings are now inaccessible and the surrounding exposure is poor.

In this chapter, a metasomatic origin will be advanced for the formation of the mineralized CSG. The source of the fluids is thought to have been of peri-anatetic nature (Sonnet et al. 1985). This model differs from the peri-granitic or sedimentary-

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exhalative models invoked for similar scheelite-bearing CSG studied elsewhere (see for instance, Newberry 1983; Casquet and Tornos 1984; Plimer 1980; Boyer and Routhier 1974; Skaarup 1974).

2 Geological Setting

The Tanneron Massif is situated in the crystalline part of Provence (Fig. 1). It comprises a para- and orthogneissic basement (Precambrian) and a paragneissic cover (early Palaeozoic) (Crevola 1977). The cover series is geochemically related to a shale-greywacke sequence and includes a thick acid volcanic intercalation at the top (Sonnet et al. 1985).

Both basement and cover were affected by the same regional metamorphism, presumably polyphased, of Caledonian age. Conditions during the last metamorphic event were of the amphibolite facies and are characterized by the presence of garnet almandite and sillimanite. The geothermometers $\text{anorthite} = \text{grossularite} + \text{sillimanite} + \text{quartz}$ (Ghent 1976; Ghent et al. 1979) and garnet-biotite (Thompson 1976; Ferry and Spear 1978) indicate fairly constant conditions (somewhere between 550° and 650 °C at 3 to 6 kb) in the massif, but with a systematic 50 °C increase where migmatites are present. Migmatitic features, located in the basement and at the base of the cover, consist of small bodies (centimetric to decimetric) of poorly foliated granite with intrusive to progressive (schlieren) contacts. In addition, veins of