Qusongite (WC): A new mineral

QINGSONG FANG,1,* WENJI BAI,1 JINGSUI YANG,1 XIANGZHEN XU,1 GUOWU LI,2 NICHENG SHI,2 MING XIONG,2 AND HE RONG1

1 Institute of Geology, Chinese Academy of Geological Sciences, Baiwanzhuang Road 26, Beijing 100037, China
2 X-ray Laboratory, China University of Geosciences (Beijing), Xueyuan Road 29, Beijing 100083, China

ABSTRACT

An unusual group of mantle minerals including about 70–80 species has been recovered from podiform chromitites of the Luobusa ophiolite, Qusong County, Tibet, China. All of the minerals were hand picked from heavy mineral separates of the chromitite. The minerals include diamond, coesite, moissanite, wustite, intermetallic compounds, Os-Ir alloys with diamond inclusions, Fe-silicides, and a new mineral, qusongite. Qusongite is associated with chromian chlorite, calcite, (W,Ti)C and (Ti,W)C alloys, and chromite. It occurs as angular grains generally 4–8 µm in diameter, but some are as large as 0.2 × 0.3 × 0.25 mm. The grains are opaque and steel-gray with a metallic luster and grayish-yellow reflection. The empirical formula (based on 2 atoms) is W_{1.006}Cr_{0.05}C_{0.992}, and the simplified formula is WC. Qusongite has a hexagonal structure and belongs to space group P6_m2, with a = 2.902(1) Å, c = 2.831(1) Å, c/a = 0.9775, V = 20.05 (1) Å³, Z = 1.

Keywords: Qusongite, new mineral, chrome, ophiolite, Qusong county, Tibet

INTRODUCTION

Qusongite is tungsten carbide (Nickel-Strunz classification I.BA.25) and was approved by IMA CNMNC in October 2007. The mineral grain has been deposited in the Geological Museum of China (GMC), registration no. 2007-034. The new mineral was named after its locality, Qusong County, Tibet, in which the Luobusa ophiolite is located.

Native metals, intermetallic grains (Fe-Ni, Cr-Ni, Fe-Co), and corresponding carbides have been discovered previously in several localities around the world (Melville 1892; Bird and Weathers 1975; Rudashevsky et al. 1983; Melcher et al. 1997; Bai et al. 2000; Robinson et al. 2004; Shi et al. 2005). Natural WC was previously reported from an occurrence in Shandong Province, China (Zhang et al. 1986) and was reported to the IMA-CNMC as a new mineral but was not approved. Some data on WC in unnamed material were also published by Glavatskikh et al. (1997).

Chromitite orebody 31 of the Luobusa ophiolite is unique in its abundance of native metals and intermetallic grains, indicating a highly reducing environment. Because the melting point of qusongite is much higher than that of other common metal carbides (Rudashevsky et al. 1983), a high-temperature environment of formation is also indicated.

Because the minerals reported here were hand-picked from a heavy mineral separate of chromitite, the possibility of natural or anthropogenic contamination cannot be completely eliminated. However, both the samples and crushing equipment were carefully cleaned before processing (Bai et al. 2000), and a 200 kg sample of granite was processed first to test for contamination. Only quartz, feldspar, garnet, mica, apatite, and zircon were recovered from the granite, and any dark or metallic minerals would have been readily recognized.

Using the same procedures with which the granite sample was processed, we recovered a wide variety of metallic minerals and alloys from the Luobusa chromitite. The recovered minerals include numerous native elements, WC, Fe-Si, Fe-Mn, diamond, Os-Ir alloy with diamond inclusions (Yang et al. 2004, 2007), silicon carbide, Fe_{0.15}Si (luobusaite) (Bai et al. 2006), Cr_{1.2} (tongbaite) (Tian et al. 1983), various kinds of platinitoid minerals, and coesite (Yang et al. 2007). (See also Fang et al. 1981; Bai et al. 2000, 2001, 2002, 2003, 2004; Robinson et al. 2004.) None of these minerals occur in the granitic sample, but many of them have been recovered from chromites of other ophiolites, processed in completely different laboratories (Robinson and Yang 2008). Thus, we are confident that the Luobusa sample is free of contamination and that the mantle chromitite origin of qusongite is well established. Some native metals and carbides similar to WC have been reported from the Koryak highlands of Russia and in Alpine metamorphic rocks (Rudashevsky et al. 1983).

OCCURRENCE AND ANALYTICAL TECHNIQUES

The new mineral, qusongite, was separated from a heavy mineral separate prepared from a 1500 kg sample of chromitite collected from orebody 31 of orebody group II of the Luobusa mining district, in Qusong county, Tibet, about 200 km ESE of Lhasa (29°5'N, 92°5'E). The chromitite is hosted in harzburgite of the Luobusa ophiolite, which lies in the Indus-Yarlung Zangbo suture zone. The ophiolite extends along the Yarlung Zangbo River for about 42 km from east to west and has a width of 1–4 km, with an exposed area of about 70 km². It consists chiefly of harzburgite, with lesser amounts of dunite, cumulate mafic rocks, pillow lava, and ophiolitic mélangé (Fig. 1) (Zhou et al. 1996; Bai et al. 2000). Numerous podiform chromitite bodies

* E-mail: yazhousi@126.com