

# Honvang serpentinite body of the Song Ma fault zone, Northern Vietnam: A remnant of oceanic lithosphere within the Indochina–South China suture

N.M. Trung<sup>a,b,\*</sup>, T. Tsujimori<sup>c</sup>, T. Itaya<sup>a</sup>

<sup>a</sup> *Research Institute of Natural Sciences, 1-1 Ridai-cho, Okayama University of Science, Okayama 700-0005, Japan*

<sup>b</sup> *Research Institute of Geology and Mineral Resources, Thanhxuan, Hanoi, Vietnam*

<sup>c</sup> *Department of Geological and Environmental Sciences, Stanford University, California 94305-2115, USA*

Received 15 February 2005; accepted 13 June 2005

Available online 9 January 2006

## Abstract

The Honvang serpentinite body in the Song Ma fault zone consists mainly of massive serpentinite, altered gabbro and rare chromitite. The serpentinite preserves relict chromian spinel with rare olivine inclusions. The compositional relationship between the Fo content of olivine (Fo<sub>90–92</sub>) and Y<sub>Cr</sub> [atomic ratio Cr/(Cr+Al)=0.43–0.44] of chromian spinel suggests that the original peridotite was spinel-bearing lherzolitic harzburgite. Chromitite is typically a high-Al type, consisting of chromian spinel with Y<sub>Cr</sub>=0.43–0.44. Saussuritized fine-grained gabbros display nearly flat rare earth element patterns, suggesting MORB-like affinity. Considering this petrotextonic information, we suggest that the serpentinite body of the Song Ma fault zone represents a remnant of paleo-oceanic lithosphere between the Indochina and South China blocks. The lherzolitic harzburgite may have formed in an environment with low degrees of melt depletion in a slow-spreading setting similar to some Tethyan paleo-oceanic lithospheres.

© 2006 Published by Elsevier B.V. on behalf of International Association for Gondwana Research.

**Keywords:** Serpentinite; Chromian spinel; Suture zone; Song Ma fault zone; Vietnam

## 1. Introduction

The amalgamation of various Gondwana-derived continental blocks during the Phanerozoic growth of the Asian continent produced numerous suture zones (e.g., Hutchison, 1975; Maruyama et al., 1989; Sengör and Natal'in, 1996; Metcalfe, 1996a,b). In particular, Mesozoic suturing along the Indochina–Yangtze boundary was one of the most crucial events, and has been defined as the Indosinian Orogeny. This orogeny has been explained by a variety of mechanisms that include multiple subduction and collision of micro-continental blocks, igneous activity, subsequent metamorphism and deformation (e.g., Lepvrier et al., 1997, 2004; Nam et al., 1998; Carter et al., 2000; Osanai et al., 2004a,b; Nakano et al., 2004). Moreover, the geotectonic history of the Indochina–South China (Yangtze) boundary was complicated by

southeastward movement of the Indochina block and subsequent regional left-lateral shearing during the Oligo-Miocene as a consequence of the Indo-Asian collision (e.g., Tapponnier et al., 1990; Gilley et al., 2003).

In northern Vietnam, several serpentinite bodies aligned along the Song Ma fault zone (SMFZ) have been considered to be fragments of oceanic lithosphere between the Indochina and South China blocks (e.g., Hutchison, 1975; Findlay and Trinh, 1997; Findlay, 1999). However, whether the ultramafic rocks represent a remnant of paleo-oceanic lithosphere is still debated due to the absence of critical petrologic evidences. In this paper we are reporting a relict chromian spinel with olivine inclusions that has been found in a serpentinite sample of the Honvang serpentinite body (HSB). The relict minerals in the HSB are described, and the petrological characteristics of chromitite and gabbroic rocks associated with the HSB are given before discussing their tectonic implications. These data provide a strong basis for the interpretation of tectonic processes that occurred during the Indosinian Orogeny in the northern Vietnam.

\* Corresponding author. Research Institute of Geology and Mineral Resources, Thanhxuan, Hanoi, Vietnam.

E-mail address: [itaya@rins.ous.ac.jp](mailto:itaya@rins.ous.ac.jp) (T. Itaya).

## 2. Geologic setting

The SMFZ is a part of the suture zone juxtaposing the Indochina and South China blocks (Hutchison, 1975; Tran et al., 1977; Bao and Luong, 1985; Chung et al., 1997; Lepvrier et al., 2004) (Fig. 1). Serpentinite bodies are sporadically exposed along the SMFZ of northern Vietnam. Northwestern extension of the SMFZ crosses a part of Laos and extends to the north of Dien Bien. To the south, the SMFZ is bounded by a fault and in contact with late Triassic undeformed granite. To the north, the SMFZ is separated from Paleozoic phyllites and amphibolite facies rocks by a high-angle fault. The HSB is an elongate body with an area of  $2 \times 4$  km, consisting mainly of massive serpentinite and fine-grained gabbro with rare chromitite. The area is extensively covered by subtropical vegetation. Apart from podiform chromitites (ca.  $4 \times 10$  m) (Trung and Itaya, 2004) the outcrops that are rarely exposed are severely weathered.

## 3. Petrography

### 3.1. Serpentinite

Serpentinite of the HSB consists mainly of chrysotile–lizardite serpentinite with minor amounts of magnetite and relict

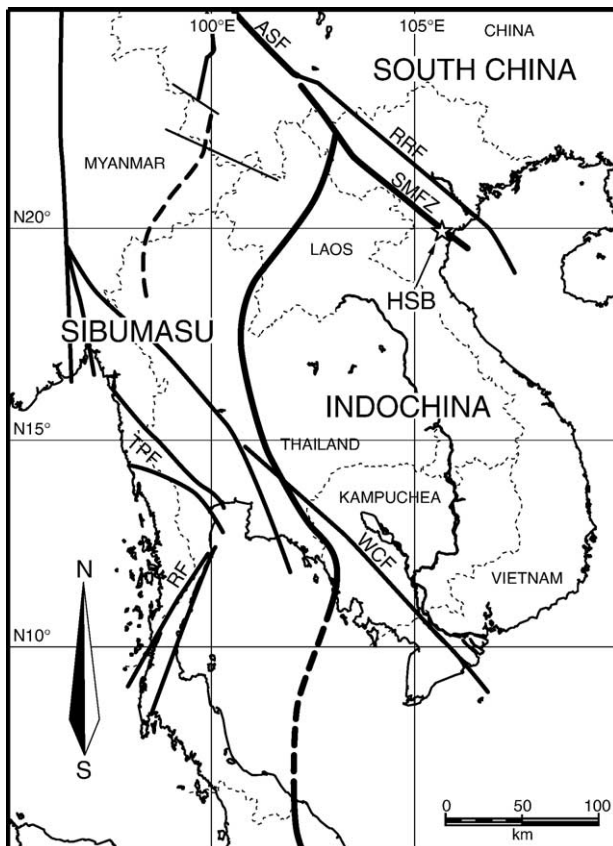


Fig. 1. Tectonic sketch showing the position of the Honvang serpentinite body. Major fault and continental blocks are based on Lepvrier et al. (2004). ASF: Ailao Shan fault; RF: Ranong fault; RRF: Red River fault; TPF: Three Pagodas fault; WCF: Wang Chao fault.

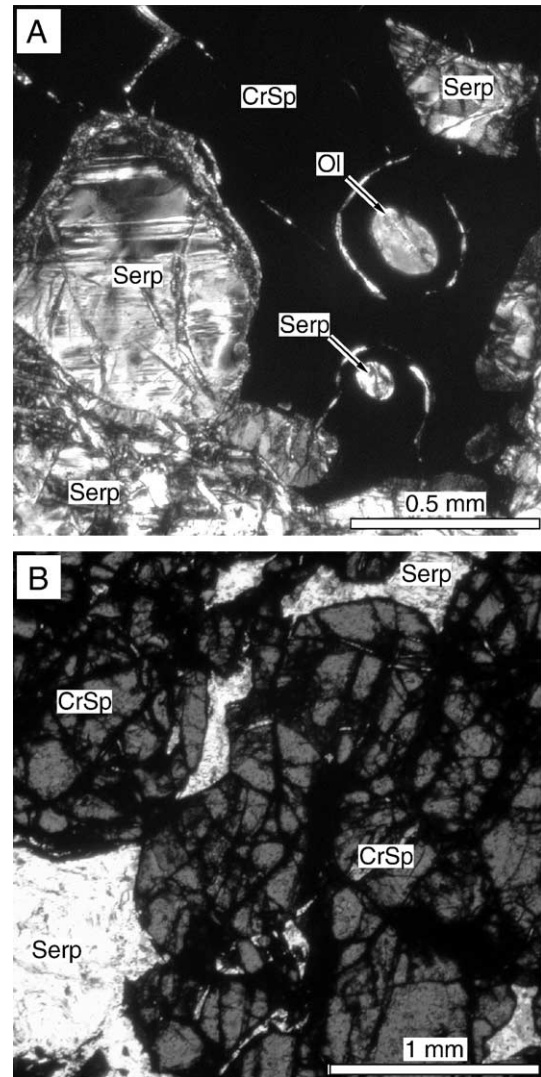


Fig. 2. Photomicrographs of serpentinite and chromitite from the HSB. (A) Crossed polarized light view of relict chromian spinel (CrSp) in serpentinite (Serp). Olivine (Ol) preserved as inclusion within chromian spinel. (B) Plane polarized light view of chromitite (abbreviations are same as A).

chromian spinel. Mesh textured pseudomorphs after olivine and rare bastite pseudomorphs after orthopyroxene are observed. Chromian spinel occurs as irregular shaped crystals. One chromian spinel grain contains rounded olivine inclusions. Rounded serpentinite inclusions in chromian spinel are interpreted to be serpentinitized olivine inclusions (Fig. 2A).

### 3.2. Chromitite

The chromitite studied in the HSB is composed of anhedral to subhedral chromian spinel (more than 95 vol.%) with serpentinite and chlorite pseudomorphs after olivine (Fig. 2B). Grain sizes of the chromian spinel range from 0.5 to 1.5 mm. Chromian spinels are replaced by magnetite along internal cracks.

### 3.3. Gabbro

The gabbro is fine-grained and altered. It consists mainly of saussuritized plagioclase, relict clinopyroxenes and titanite

Download English Version:

<https://daneshyari.com/en/article/4728035>

Download Persian Version:

<https://daneshyari.com/article/4728035>

[Daneshyari.com](https://daneshyari.com)