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Awaruite in serpentinites from Oshima Peninsula, Fukui Prefecture, Japan

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Awaruite is one of native Ni-Fe alloys, and the compositional range is Ni_2Fe to Ni_3Fe. The space group is *Fm3m* or *Pm3m* (e.g., Williams, 1960; Ahmed et al., 1981). Typical grain sizes are 10-300 μm, and grain shapes are typically irregular, anhedral or skeletal. It is found only in the serpentinized peridotites and chondritic meteorites (e.g., Ramdohr, 1967; Clarke et al., 1970). In general, awaruite is observed in serpentine vein (Sakai and Kuroda, 1983), and coexist with other metal minerals (Kanehira et al., 1975). This study deals with the characteristic occurrence of awaruite in pseudomorph texture in the Oshima serpentinites from Oshima peninsula, Fukui prefecture, Japan.

All samples were examined with polarizing microscope observation, X-ray diffraction analysis and SEM-EDS analyses. Preparation of TEM specimen and microtexture observation were conducted with an ion milling machine (JEOL EM-09100IS) and TEM (JEOL JEM-2000FX, JEM-3200FSK) in the Research Laboratory for High Voltage Electron Microscopy (HVEM), Kyushu University, Japan. Chemical analyses of microtexture were also examined using JEM-3200FSK equipped with EDS.

Peridotites in this area are partially or perfectly serpentinized. Texture of the serpentinite is mesh texture after forsterite and vein texture. Scarcely serpentinized enstatite is also observed. Each mesh texture is composed of mesh rim shows optical anisotropy and mesh core shows optical isotropy. The serpentinization of mesh texture is strong in close to vein textures. Most mesh rims near vein texture consist of some layers; outer rim, outer-inner rim boundary and inner rim. These rims consist of chrysotile, about 50 nm in width and 2 μm in length, and lizardite, about 300 nm in width and 1 μm in length, and outer-inner rim boundary about 2 μm in width are filled with serpentine fine grains, up to 100 nm in diameter.

A number of awaruite fine grains, 200-300 nm diameter, array along cell boundary, outer-inner rim boundary and rim-core boundary. These awaruite coexist with no other metal minerals; pentlandite, magnetite and etc. In contrast, metal minerals in vein texture are magnetite and minor pentlandite. These results indicate that mesh texture in serpentinite is extremely reductive environment compared with vein texture. The chemical composition of awaruite (average of four analysis) is Ni 73.13% and Fe 26.87%. The cross-section of these awaruite grains is square or rhombic, indicating that these grains are cube or octahedral crystals (fig. 1a). These grains seem to be euhedral from grain shapes, and this is characteristic compared with previous studies (e.g., Rubin, 1991). The SAED pattern recorded along the [001] zone axis shows strong 200, 220 reflections and weak 100, 110 reflections (fig. 1b). This indicates space group of the Oshima awaruite is *Pm3m*, which is ordering phase of *Fm3m* awaruite. Lower symmetry of the Oshima awaruite will be formed lower temperature.

Keywords: Awaruite, Mesh texture, Serpentinite, Microtexture, Serpentine minerals, TEM

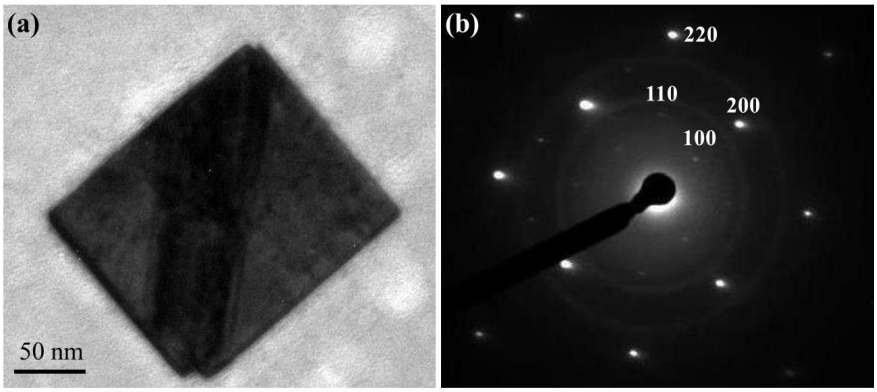

Fig. 1. (a) TEM image of awaruite in mesh texture. (b) The SAED pattern of (a) recorded along the [100] zone axis.