

## Variation of late intrusives in the crustal section of Oman ophiolite

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The volcanic stratigraphy in the Oman ophiolite shows that the ophiolite underwent multiple stage of magmatism under different tectonic conditions (e.g., Alabaster et al., 1982; Lippard et al., 1986). However the volcanic stratigraphic division and tectonic settings of each volcanic stage are still controversial. The volcanic activities are generally divided into three stages. The earliest stage is a magmatism at fast-spreading ocean ridges where main constitution of the Oman ophiolite (= oceanic crust) was formed.

On the other hand, many and various plutonic bodies intruded into the plutonic section of the Oman ophiolite. But it is not always clear that each intrusive plutonic body corresponds to which volcanic stage. The most common late intrusive body is composed of euhedral olivines and interstitial clinopyroxenes with cumulate texture and called "wehrlite intrusions" (e.g. Juteau et al., 1988; Jousselin and Nicolas, 2000; Koepke et al., 2009). Juteau et al. (1988) estimated that the amount of "wehrlite intrusions" attains up to 20% of the crust sequence. The intruding time and source of wehrlite intrusions are interpreted as follows; 1) plutonic phase of off-axis volcanics which are squeezed from mantle-crust transition zone (e.g., Jousselin and Nicolas, 2000) and 2) plutonic equivalent to V2 (Alley) volcanism (e.g., Juteau et al., 1988; Reuber, 1989; Uesugi and Arai, 2001). Thus the origins of the ultramafic intrusions of the Oman ophiolite are still under debate. Although, the ultramafic intrusions have been usually described as "wehrlite intrusions", most of them contain considerable amount of plagioclase. There are few true wehrlite, and olivine melagabbro and plagioclase wehrlite are predominant lithofacies of the "wehrlite intrusion" (Koga et al., 2001).

Meanwhile, some of the "wehrlite intrusions" are composed of pyroxene cumulate with orthopyroxene (Adachi and Miyashita, 2003, Yamasaki et al, 2003). In Wadi Fizh to Wadi Bani Umar area in the northern Oman ophiolite, a large ultramafic to acidic plutonic complex is exposed. Reuber (1988) and Juteau et al. (1988) described this plutonic complex as a huge typical "wehrlite intrusion". But this plutonic complex is composed of clinopyroxene cumulate, olivine clinopyroxene cumulate, orthopyroxene cumulate, websterite and gabbronorite with diorite and tonalite dikes, indicating that this complex is distinct from common "wehrlite intrusion" (Adachi and Miyashita, 2003).

On the other hand, Lippard et al. (1986) recognized two types of late intrusions; older series of large gabbro to plagiogranite pluton, and younger and smaller peridotite-gabbro intrusions. The former is correlated to the Lasail unit and the latter may be related to the Alley unit or younger than the Alley unit (Lippard et al., 1986: Fig. 3.3). They linked the older late intrusives to the WNW-trending dikes. Therefore, the relation between various late intrusive plutonics and volcanic stratigraphy is still to be studied.

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