

Comparison of geological, textural and petrographic characteristics of the pillow lava flows from the areas of Malo Buchino, Babitsa and Nedelkovo villages (Western Srednogie)

Сравнение на геоложки, структурни и петрографски особености на пилоу-лавовите потоци от районите на селата Мало Бучино, Бабица и Неделково (Западно Средногорие)

Stefan Velev, Rossen Nedialkov
Стефан Велев, Росен Недялков

Sofia University, Faculty of Geology and Geography, 15 Tzar Osvoboditel Blvd., 1505 Sofia; E-mail: med@gea.uni-sofia.bg

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Introduction

Previous investigations of the Western Srednogie volcanism have determined it as syn-subductional (Dabovski et al., 2008). Pillow lavas are determined in the intermediate volcanogenic-sedimentary formation. In this paper we determine the outcrops and describe the characteristics of pillow lava sequences, focusing on their textures and petrography.

Areas of investigation, geology and stratigraphy

The studied pillow lavas are exposed in 3 areas: Malo Buchino, Babitsa and Nedelkovo. They belong to the intermediate volcanogenic-sedimentary formation (Dabovski et al., 2008). The volcano-sedimentary sequences at present days are with vertical position of the layers.

In the area SW of the village of Malo Buchino are established 3 pillow lava flows and one simple (massive), intercalated with sedimentary rocks (tephraturbidite flysh and fine-layered marls), agglomerate and coarse ash tuffs. The pillow lava flows have thickness of 30 to 50 m. Pillows are up to 10–12 m long and up to 2–3 m in cross sections. One subvolcanic body is intruded in one of the pillow lava flows.

The volcano-sedimentary sequence of Babitsa is produced of 2 pillow lava flows, separating by one 8 m thick epiclastic layer. The pillow lava deposits are overlain by thick (>20 m) bomb-rich psamitic ash tuff. The bombs (5 to 35 cm) are spherical and elongated, ellipsoidal in shape.

In the area NE of the villages of Nedelkovo and Filipovtsi are exposed 2 pillow lava flows. In many outcrops the typical pillow lavas morphology is not observed or very hardly recognized in the normal topography. Their recognition is confirmed by the use

petrographic criteria especially the petrography of the chilled outer zones with skeletal microliths in the groundmass. The pillow lavas associate with sedimentary and volcano-sedimentary rocks. Several dykes are intruded discordantly or accordantly the sedimentary sequence.

Morphology, size and internal textures of pillow lavas

The studied pillows are classified as mega-pillows, using the size classification scheme of Walker (1992), in which diameters of less than 100 cm are pillows. Mega-pillows exposed in cross sections are components of a network of interconnected tubes, fed presumably from several fissure vents.

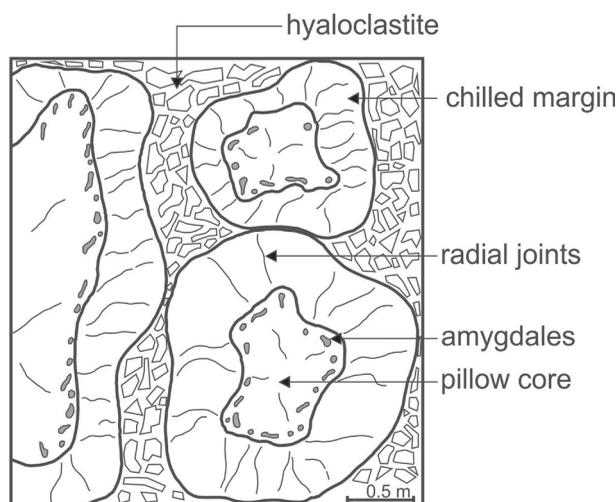


Fig. 1. Schematic drawing of the internal textures of pillow lavas

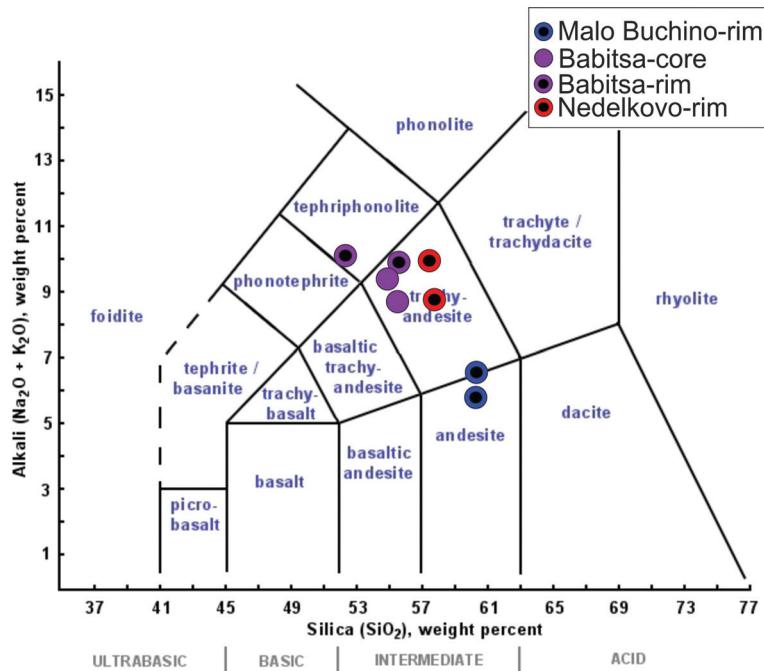


Fig. 2. TAS classification diagram (Le Maitre et al., 1989)

Transverse spreading cracks occur on the upper and side margins of pillow surfaces, perpendicular to the elongation direction of pillow growth (Bear, Cas, 2006). Each pillow is characterized by a massive core and chilled margin with thickness from 5 to 23 cm. Hyaloclastites, described in details by Banushev (2000), occur as irregular flows, lens-like bodies and masses disposed between the pillows. The majority of the pillows exhibit well-preserved radial joints, which radiate from the central massive core of the pillow to the outer margins (Fig. 1). Radial joints are spaced 10–15 cm apart.

Petrography and geochemistry

All pillow lavas are with big plagioclase phenocrysts (up to 1 cm) and relatively small clinopyroxene (up to 1.5 mm). Pillow lava flows at Malo Buchino are composed of porphyritic andesites with phenocrysts of plagioclase and clinopyroxene. Accessory minerals are apatite and magnetite. These at Babitsa and Nedelkovo are classified as a latites with the same phenocrysts, but with rare biotite, included in plagioclase phenocrysts (Fig. 2).

The groundmass texture in the central part of the pillow is recrystallized. Groundmass in chilled periphery

is very dense and has hyalitic texture with skeletal microliths of pyroxene, plagioclase and ore mineral (lepidocrocite). In rare cases (close to radial joints) volcanic glass is recrystallized (submicroscopic fine grains).

The pillow lavas of the vicinity of Malo Buchino are high-K calc-alkaline, and these from Babitsa and Nedelkovo belong to shoshonite series.

Conclusions

The dominant part of the massive volcanic rocks in the intermediate volcanogenic-sedimentary formation is presented by pillow lavas. In this formation are present some subvolcanic bodies (often clearly petrographically different) but some of them are probably with subsequent age, intruded in the already folded, subvertical volcanic sequence.

Most probably volcanic vents for the pillow lava flows are fissural and the magma comes from different feeding magmatic chambers for the pillow lavas of Malo Buchino and those from Nedelkovo.

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