Lithofacies and Structural Development of the Sanukayama Rhyolite lava in Kozushima Island, Japan

*Kuniyuki Furukawa[1], Koji Uno[2], Kotaro Nakai[2], Tatsuo Kanamaru[3]

1. Aichi University, 2. Okayama University, 3. Nihon University

The Sanukayama rhyolite lava (Taniguchi, 1977; Isshiki, 1982; Goto et al., 2014) is distributed along the east coast of Kozushima Island, Japan. The ages are 70+/-5ka (Kaneoka and Suzuki, 1970), 110+/-30ka (Sugihara and Danhara, 2008), 46+/-3 and 68+/-5ka (Yokoyama et al., 2004). The lava is well exposed over 150m in height. The vertical lithofacies are mainly divided into the following three facies and transition zones between them. We describe the lithofacies and discuss the development processes.
*Pumiceous layer (Upper 40m)
Description: This layer is mainly composed of light gray- to pinkish-colored massive pumice with no obsidian. The pumice is partially brecciated into the elongated shape, and the clasts tend to be aligned to nearly vertically. The anisotropy of magnetic susceptibility (AMS) results show that the pumice was compacted horizontally rather than vertically.
Interpretation: The pumiceous layer was generated from effervescence of the upper part of the lava. The vertical oriented clasts and AMS results are consistent with the diapiric inflation (Fink and Manley, 1987).
*Obsidian layer (Middle 20m)
Description: The layer is composed of massive obsidian with nearly lack of microlites. The ductile-deformed light-colored veins, mainly with a few mm thick (exceptionally 1m thick) and a few to several meters long, are frequently observed. In the microscopic observation, the veins are composed of broken crystals and obsidian clasts.
Interpretation: In this layer, extensive vesiculation and microlite development would be prevented by higher load pressure and faster cooling, respectively, and resulted in the obsidian. The lava fracturing was ubiquitously occurred by flow-induced shear during ductile-brittle transition (Tuffen et al., 2003). The fractures were subsequently healed and deformed. Degassing would be promoted via the pervasive fractures, and the water contents of the obsidian layer would become heterogeneous.
*Crystalline rhyolite layer (Lower 50m)
Description: The layer is composed of light gray-colored crystalline rhyolite. The rhyolite is characterized by high vesicularity and flow banding. The vesicles are spherical shape with <1cm in diameter. The flow banding is defined by the ductile-deformed dark-colored veins, with 0.5mm thick and more than several cm long, and by aligned vesicles along the veins. The microscopic observation shows that the veins are composed of the microlite alignment associated with the surrounding spherulite trail.
Interpretation: The microlites would be developed on the healed fractures due to high heat retention comparing to the upper obsidian under large undercooling condition. Subsequently, the microlites acted as nucleation site of spherulite. The water rejection from the aligned spherulite consequently formed aligned vesicles.
*Pumiceous ~ Obsidian layers (<10m in thickness)
Description: The abundant discontinuous pumiceous layers with a few cm to 1m thick are intercalated in the obsidian. The layers tend to become thick into the upper part. The individual layers are linked each other by the pumiceous network.
Interpretation: The inhomogeneous water contents of the obsidian layer would be resulted in inhomogeneous effervescence. The pumiceous part are flattened by flow-induced shear and accumulated in upper part of the obsidian layer by buoyant force.
*Obsidian ~ Crystalline rhyolite layers (<10m in thickness)

Description: The crystalline rhyolite fragments are scattered within the obsidian layer. In the marginal part of the fragments, the vesicles show spherical shape, and spherulites are not broken at all. This indicates that the spherulites and vesicles were not deformed, and were developed after fragmentation.
Interpretation: The microlite development would induce increasing of viscosity. The high viscous microlite-rich layer would be fragmented by flow-induced shear. The spherulitic growth is subsequently occurred in the fragments as well as lower crystalline layer.

Keywords: rhyolite, obsidian, degassing, spherulite, Kozushima

