Seafloor hydrothermal vents in the TA25 caldera, Tonga; mineralization and fluid inclusion study

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Seabed hydrothermal chimneys and mounds were discovered in the western TA25 caldera, Tonga-Kermadec Arc, which was first finding in this subsea volcano. TA25 seamount is featured by a large funnel-shaped caldera ~6.5km in diameter and >1.1 ㎞ in depth. The caldera is primarily hosted by basaltic andesite and the hydrothermal chimenys are distributed in either sides of the eastern and western inner flank of caldera. The extensive hydrothermal vents are clustered along the NE-SW fracture zone which might have been a part of the radial fault sets.

Chimneys are mostly active and are spewing transparent fluid, so-called white smoks. Chimneys in the area are 0.5 to 2m tall, averaging 0.5m tall. Several small chimneys(<0.5m) are oftenly cluster each other and its outmost crusts are covered with barite. Venting fluids range from 87℃ to 242℃, showing relatively low temperatures. Mound is covered by Fe-oxides up to 3m in diameter. Active chimneys closely relate to various vent faunas such as mussel and sea anemone.

In both of chimney and mound, sphalerite is so predominant mineral, which this orebodys could be categorized into Zn-dominant ores. Besides, pyrite(marcasite), galena, covellite, enargite, tennantite with minor chalcopyrite occur as minor constitutes of ores. Main sulfates are barite and gypsum(anhydrite), constructing outmost crust of chimney. But chalcopyrite in the mound has more frequent occurrence than in the chminey. The FeS content of sphalerite increases from outside to inside of vent conduit, respectively.

Fluid Inclusions mainly show two-phase liquid-rich inclusionsion. Inclusion varies but its size majorly is less than 50 ㎛ with irregular shape. Homogenize temperatures ranges between 148℃ and 341℃. Salinities deduced from final ice melting (Tm-ice) temperature range of 3.6 to 0.4 wt% NaCl equivalent, implying higher mineralization temperature at the mound than at the chimney.