

Authigenic carbonates associated with fossil cold-seep assemblages from the lower Pliocene, northwest Leyte, Philippines

Masao Maeda[1]; Ryuichi Majima[1]; Tomoki Kase[2]; Shungo Kawagata[1]; Yolanda Aguilar[3]; Hideki Wada[4]

[1] EdHS, Yokohama Natn. Univ.; [2] Geology and Paleontology, Nat. Mus. Nature and Sci.; [3] MGB, Philippines; [4] Faculty of Science, Shizuoka Univ.

<http://chigaku.ed.ynu.ac.jp/majimaken/majimaken.html>

The northwest Leyte is located in the northeastern edge of the Visayan Basin, bordered by the NW-SE trending Philippine Fault and Leyte Volcanic Belt on the east. In this region, the Neogene back-arc (Rangin et al., 1989) basin-fill deposits are widely exposed. The sedimentary structure forms a north-northwest trending anticlinorium axis. Therefore, older strata (Oligocene) are distributed in the central area and younger ones in the marginal area (Corby et al., 1951; Porth et al., 1989; Aguilar, 1995). The sedimentary environment of the marginal area is estimated as upper to middle bathyal in water depth on the basis of the lithology (Porth et al., 1989).

Kase et al. (2005) discovered fossilized chemosynthetic molluscan assemblages from the Liog Point, western coast of northwest Leyte. This is the first discovery of fossil cold-seep assemblages from SE Asia. In subsequent surveys, Majima et al. (2007) reported several fossil cold-seep sites (their locs. 2, 4, 5, 7, 8, and 9) from the lower Pliocene deposits (3.8-3.65 Ma) around the coastal area, ranging 4 km north-northwestward to 7km south-southeastward from the Liog Point.

Majima et al. (2007) recognized the fossil cold-seep sites based on two features: 1) the abundant and exclusive occurrences of large chemosynthetic invertebrates, and 2) associated authigenic carbonates greatly depleted in ^{13}C .

We herein report the mineralogy and stable isotopic signatures of the authigenic carbonates associated with chemoautotrophic large bivalves, as follows (for localities, see Majima et al., 2007).

(1) Loc. 2: Several float blocks enclose fossil articulated bivalves densely or diffusively. The largest block is over 3 m in diameter. Authigenic carbonates of the matrix of the block are composed of low-Mg calcite, with the carbon and oxygen stable isotopic ratios of -22.7 and -2.8 (per mill vs. PDB), respectively.

(2) Loc. 4: Kase et al. (2005) firstly discovered densely packed fossil articulated bivalves *Calypptogena* sp. in four huge cemented blocks (up to 5 m in diameter). Authigenic carbonates are composed of aragonite and low-Mg calcite, with $\delta^{13}\text{C} = -42.0$ and $\delta^{18}\text{O} = 0.9$ (per mill vs. PDB).

(3) Loc. 5: Chimney-like carbonate concretions are exposed sub-vertically to bedding. The largest concretion is 15cm in diameter at about 50cm high. Authigenic carbonates are composed of low-Mg calcite, with $\delta^{13}\text{C} = -16.6$ to -21.2 and $\delta^{18}\text{O} = -6.2$ to -5.4 (per mill vs. PDB). Furthermore, radial fissures are observed on cross sections, and filled with low-Mg calcite spar with $\delta^{13}\text{C} = -14.3$ and $\delta^{18}\text{O} = -6.8$ (per mill vs. PDB).

(4) Loc. 7: Burrow-cemented carbonate concretions are abundant in this locality. Massive concretions from this outcrop and float stones enclose fossil articulated bivalves.