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Chemical characteristics of arc magma and seafloor sulfide deposits on back-arc spreading center and off-ridge volcanoes

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The arc basalt of Mariana Trough is characterized by fluid-dominated chemistry. Stolper and Newman (1994) suggested that the H2O-enriched arc magma of the Mariana Trough could be formed as melting mixture between MORB-type mantle source and H2O-rich component.

Backarc Spreading Center and the off-ridge volcanoes in Southern Mariana Trough are selected as one of the main targets of TAIGA Project, due mainly to four known active hydrothermal fields; Snail site (12o57.19'N, 143o37.16'E, depth:2861m) and Yamanaka site (12o56.64'N, 143o36.80'E, depth: 2823m) on the spreading-axis, Archean site (12o56.35'N, 143o37.89'E, depth: 2986m), and Pika site (12o55.13'N, 143o38.92'E, depth: 2773m) on the off-axis seamount. Nine BMS (Benthic Multi-coring System) drillings were conducted during the Hakurei-Maru No.2 cruise in June 2010.

Both basalt glasses and associated seafloor massive sulfide ores from these sites are analyzed for their major/minor element contents using ICP-MS. Multi-element plot of basalt glass indicates that both on-axis and off-axis basalts have similar pattern and are categorized as arc basalt and/or arc basaltic andesite. As, Ba, Pb and other elements in sulfide ores show systematic variation across the axis and reflect the influence of subduction zone fluids.

Keywords: Mariana Trough, backarc spreading, hydrothermal deposit, TAIGA project, minor element, incompatible element