

## AP project drilling at the Toyoha Pb-Zn-Cu-Ag hydrothermal deposit, Hokkaido

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We made 116m drilling at the Toyoha Pb-Zn-Cu-Ag hydrothermal deposit using a normal inner (44mm diameter) and outer barrel system. We could penetrate Pb-Zn-Cu-Ag veins at 102 to 116m depths. We also obtained hot water (>70C), yielding 1L/min from the veins. We also used a threefold pipe system with the innermost 90cm-long translucent Teflon liner (35.8mm diameter and stable at 150C) and normal inner and outer barrels at 102m depths. The Teflon liner was assumed to be very useful for handling rock cores to minimizing their contamination by circulation water and minimizing their exposure time with air. The coring with the Teflon liner, however, was not so successful. Rock cores were cracked in 5 to 10cm pieces, due to stress caused by the complicated threefold pipe system.

Sub-seafloor of the submarine hydrothermal systems are characterized by high temperature (<350C) and H<sub>2</sub>S and CO<sub>2</sub> rich environments which may be analogous to the anaerobic conditions of the early stage Earth surface. These hydrothermal systems, therefore, provide us unique opportunities for studying the evolutionally history of microorganisms and the origin of life. One of the most important techniques we must develop, for approaching the submarine microbiological communities, is drilling and core-sampling with preserving the anaerobic environment of the submarine hydrothermal systems. We must treat the core samples carefully to prevent serious contamination by contacting them with aerobic seawater and surface sediments.

Toyoha polymetallic mine in Hokkaido is one of the largest Pb-Zn-Cu-Ag vein-type hydrothermal deposit which formed by the very young terrestrial hydrothermal activity at 2.93 to 0.49Ma. Geothermal activity, characterized by high temperature (<250C) and high H<sub>2</sub>S, is still continuous from the main mineralization stage at the southeastern part of the mining area nearby Soya-Izumo-Shinano vein systems in Miocene basalt lava. The deposit is one of the best field for developing drilling and sampling technique which must be used at the sub-seafloor hydrothermal systems, because high temperature (>100C) and anaerobic fluids may exist along the quartz-sulfide veins in the basalt lava at the Toyoha deposit.

We made 116m drilling at -550mL Soya site of the Toyoha deposit using a normal NQ inner (44mm diameter) and outer barrel system. We could penetrate Pb-Zn-Cu-Ag veins (Izumo veins) at 102 to 116m depths. We also obtained hot water (>70C), yielding 1L/min from the veins. We also used a threefold pipe system with the innermost 90cm-long translucent Teflon liner (35.8mm diameter and stable at 150C) and normal inner and outer barrels at 102m depths.

The Teflon liner was assumed to be very useful for handling rock cores to minimizing their contamination by circulation water and minimizing their exposure time with air. The coring with the Teflon liner, however, was not so successful. Rock cores were cracked in 5 to 10cm pieces, due to stress caused by the complicated threefold pipe system.