Goldschmidt 2022 Abstract
https://doi.org/10.46427/gold2022.11378

Hydrothermal mineralization at continental breakup - geochemical insights from sulfide minerals from the South China Sea

JÖRG FOLLMANN[1], FROUKJE M. VAN DER ZWAN[1], SVEN PETERSEN[2] AND MATTHIAS FRISCHE[2]

[1]King Abdullah University of Science and Technology
[2]GEOMAR Helmholtz Centre for Ocean Research
Presenting Author: joerg.follmann@kaust.edu.sa

The processes of plate rupturing and transition from rifting continental lithosphere to an oceanic spreading center are important to understand the formation of oceanic basins but details remain unclear[1,2]. Hydrothermal samples provide information about cooling of a young lithosphere and element redistribution but have so far not been recovered from rifted margins.

The northern margin of the South China Sea oceanic basin is an example of a location where continental breakup can be observed. This transition zone between continental and oceanic was drilled during IODP Expedition 368 and revealed the presence of MORB pillow basalts, intensively modified by hydrothermal alteration from intergranular to cm-scale veins of quartz, euhedral epidote, sulfide minerals and carbonates[3].

We used detailed petrographic characterization along with main and trace element data of sulfide minerals of the drilled hydrothermally altered crust to determine different phases of fluid circulation and the corresponding precipitates. Pyrite as the dominant sulfide phase shows a range in composition, mineralized in different generations, crystal sizes, and habitus, indicating different characteristics of the fluids for different types of alteration generations. A complex coexistence of Fe-Cu-sulfides reveal changes in the fluid regime and element supply.

Supported by additional data from sphalerite, chalcopyrite, covellite, and main element chemistry of the carbonate phases, we show the evolution and chronological sequence of the precipitated sulfide phases to provide insights into the hydrothermal circulation in the rifting to spreading transition of a young oceanic basin.

[1] Courtillot, V. (1982) Propagating rifts and continental breakup. *Tectonics*, 1(3): 239-250.

[2] Withmarsh R., Manatschal, G., Minshull, T. (2001) Evolution of magma-poor continental margins from rifting to seafloor spreading. *Nature*, 413 (6852): 150-154.

[3] Sun, Z., Jian, Z., Stock, J.M., Larsen, H.C., Klaus, A., Alvarez Zarikian, C.A., and the Expedition 367/368 Scientists (2018) Site U1502. *Proceedings of the International Ocean Discovery Program*, 367/368.