Serpentinization processes and their effect on formation of submarine sulfide deposits at the Rodriguez Triple Junction

H. FRANKE[1] AND U. SCHWARZ-SCHAMPERA[1]

[1]Federal Institute for Geosciences and Natural Resources (BGR), D 30655 Hannover, Germany, Henrike.Franke@bgr.de

The area around Rodriguez Triple Junction (RTJ) is characterized by complex structured rift valleys and isolated active volcanic edifices in the central graben. The structural development has triggered complex petrogenetic processes including differentiation and fractionation processes as well as the exhumation of deep oceanic lithosphere. The complex structural conditions at the RTJ and different spreading characteristics of the three adjacent ridges with active fault systems and sustainable heat supply provoke hydrothermal activity along the rift valleys such as the Kairei vent field.

A series of INDEX cruises explored the southern Central Indian Ridge to recover hydrothermal precipitates and a rock suite representing the entire oceanic lithosphere and including basaltic, gabbroic and ultramafic lithologies.

Gabbros are lithologically massive with variable compositions (olivine gabbro, oxide-rich gabbro, and norite) and grain sizes. They are mainly composed of plagioclase, partial to total serpentinized clinopyroxene and olivine, and monosulfide solid solution phases. Different trace element signatures are determined in all gabbroic samples and they may be grouped into differentiated and cumulate varieties which indicate the formation at variable depths.

The ultramafic rocks are best classified as altered harzburgites with variable degrees of serpentinisation. A characteristic mesh structure with replaced olivine by serpentine and magnetite can be noticed. Minor bastitized orthopyroxene, chromium-spinel and relics of primary olivine occur in the less serpentinized samples. The occurrence of serpentine slickensides provides serpentinisation process during exhumation of the rock suites.

It is suggested that serpentinization processes produce high-temperature, reducing, and acid fluids which are necessary conditions to form submarine sulfide deposits. This study attempts to distinguish the characteristics and influence of these metamorphogenic fluids on the sulfide precipitates and their associated rock suite.