

Middle Archean seafloor hydrothermal alteration in the Cleaverville area, Pilbara Craton, Western Australia

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Middle Archean hydrothermally metamorphosed/carbonatized greenstone complex capped by bedded cherts and exposed in the Cleaverville area, Western Australia, is interpreted as an accretionary complex because of the presence of both duplex structure and an oceanic crust stratigraphy. Three mineral zones have been defined; zone A of the sub-greenschist facies, zone B of the greenschist facies, and zone C of the transition from greenschist to amphibolite facies. The boundaries between zones A and B, and zone B and C are subparallel to the bedding plane of overlying chert, and that metamorphic temperature increases stratigraphically downward. It is consistent with the thermal structure of ocean floor metamorphism at modern mid-ocean ridge. This feature suggests that ocean floor metamorphism at middle Archean is well preserved in the Cleaverville area. In zone A, Ca-Al silicates including Ca-zeolites, prehnite, pumpellyite and epidote are almost absent except for a few samples. However, carbonate minerals are ubiquitous in all zones and modal amount decrease stratigraphically downward; average modal amount of carbonate in the greenstones is 9.7 %. This value is much higher than that of present-day oceanic crust. These results suggest that ocean floor metamorphism is important process of interaction between rock and ocean-atmosphere, and had an important role to the surface environment.