Substrate-controlled crystallization of calcite and aragonite

FANGFU ZHANG[1], H. XU[1], G. FARFAN[2], J. HUBERTY[1], H. KONISHI AND E.R. RODEN[1]

[1]Department of Geology and Geophysics, University of Wisconsin, Madison, WI 53706, USA
[2]Madison West High School, Madison, WI 53726, USA

Both calcite and aragonite are common minerals on the earth surface. Ca-carbonate minerals are very important for balancing Ca and carbon cycles in the earth system. Late stage fibrous minerals that fill or partially fill some voids in Cenozoic basalt from Dust Devil Mine in Lake County, Oregon, were investigated using optical microscopy and X-ray diffraction. XRD patterns indicate the fillings are dominated by aragonite with small amount of calcite. The amount of calcite in the mixture ranges from ~ 3% to ~10 %. The substrate of the aragonite aggregates are hematite-bearing glass matrix. Both texture and associated minerals indicate the aragonite is not biogenic. We propose that hematite substrate can also enhance aragonite formation besides solution composition. Aragonite (~ 90%) and calcite (~10%) was obtained in a Ca-bearing solution; and pure aragonite was obtained in a solution with Mg/Ca ratio of 0.25. The carbonate grew in hematite-free solutions only result in pure calcite. Both natural sample and synthesized samples prove that high-pressure structure phase aragonite can precipitate on hematite surface or in hematite-bearing suspensions. It is proposed that both surface structure and surface acidity of hematite may cause the aragonite formation.

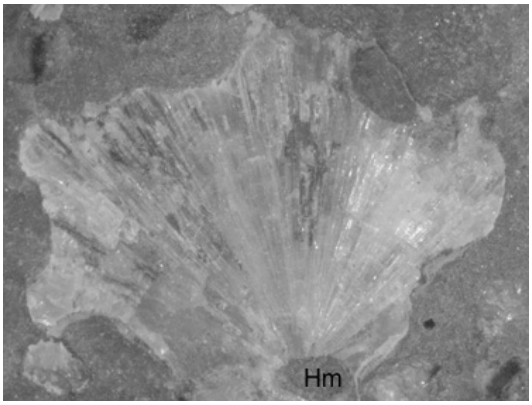

Figure 1: Aragonite crystals (with small amount of calcite) grow at a hematite-bearing surface (Hm). (Image width: ~ 4 mm)

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Geochronology of the Altay adakite and the initiation of the Paleo-Asian Ocean subduction

HAIXIANG ZHANG*, X. SHEN AND L. MA

Key Laboratory of Isotope Geochronology and Geochemistry, Guangzhou Institue of Geochemistry, CAS, Guangzhou, 510640, China (*correspondence: zhanghx@gig.ac.cn)

Petrological and geochemical characteriustics of andesites from the Fuyun region, Altay are simiar to those of adakites and, were likely derived by partial melting of the subducted neonatal Paleo-Asian Oceanic crust [1]. LA-ICP-MS zircon U-Pb dating of an adakite has been carried out to give better constraints on the beginning of the Paleo-Asian Ocean subduction in this study. The $^{206}Pb/^{238}U$ ages of 30 measurement spots range from 436.1 to 449.6 Ma along the accordant line with an average age of 441.3±1.8Ma (Fig. 1). This is the formation time of the adakite, which represents the low limit of the onset of the Paleo-Asian Ocean subduction underneath Siberian plate.

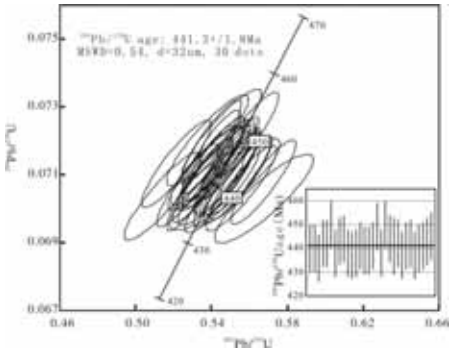

Figure 1: U-Pb consonant diagram of zircon.

The tectonic evolution of north Xinjiang and, the formation and evolution of the Paleo-Asian Ocean are not well agreed due to lack of precise geochronology data [2, 3]. Recent studies based on fossil records suggested that the accretion of the Central Asian Orogenic Belt to south occurred during early Paleozoic [4, 5]. Here we provide precise ischronological data, supporting that the outset of the subduction of the Paleo-Asian Ocean in north Xinjiang started at least in the Early Silurian (441.3±1.8Ma).

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