American Mineralogist, Volume 101, pages 448–460, 2016

Genesis of chromium-rich kyanite in eclogite-facies Cr-spinel-bearing gabbroic cumulates, Pohorje Massif, Eastern Alps

Christoph A. Hauzenberger[1,*], Harald Taferner[1], and Jürgen Konzett[2]

[1]Institute of Earth Sciences, Karl-Franzens-University of Graz, Universitaetsplatz 2, Graz, 8010, Austria
[2]Institute of Mineralogy und Petrography, University of Innsbruck, Innrain 52, Innsbruck, 6020, Austria

Abstract

Natural kyanites with Cr_2O_3 contents >1 wt% are very rare and known only from high-*P* environments, for example, eclogite-facies gabbroic cumulates containing Cr-spinel from the Pohorje Massif, Eastern Alps, Slovenia. In these rocks, turquoise-colored Cr-rich kyanites are present in two different textural types. A first type has formed as blocky crystals of several hundred micrometers in size around clusters of small drop-like Cr-spinels. This kyanite shows a highly irregular Cr distribution and may contain up to 15.6 wt% Cr_2O_3, which is one of the highest Cr_2O_3 contents reported so far. A second type is present as part of reaction coronas around large red-brownish Cr-spinel and forms deep-blue needle-like crystals that rarely exceed 100 μm in size. This kyanite contains up to 8.2 wt% Cr_2O_3 and is associated with Cr-rich corundum (≤9.1 wt% Cr_2O_3) and Cr-Al-rich pargasite (≤3.9 wt% Cr_2O_3). The formation of kyanite around Cr-spinel droplets is interpreted to be the result of increasing *P-T* conditions during prograde metamorphism where Cr-spinel and plagioclase or quartz react to Cr-kyanite, ±garnet, ±omphacite. In contrast, the formation of kyanite associated with Cr-rich corundum and Cr-rich pargasite within coronas around Cr-spinel occurred in an early stage of the retrogressive evolution of the gabbroic cumulates at eclogite-facies conditions of ~2.5 GPa and 750–800 °C triggered by the influx of H_2O-rich fluids. The driving force for developing these coronas was an increase in the chemical potential of silica caused by the infiltrating hydrous fluid phase. *P-T* estimates using matrix mineral assemblage place the peak metamorphic conditions close to the quartz/coesite transition with temperatures in the range of 750–810 °C and pressures of ~2.9 GPa.

Keywords: Cr-rich kyanite, Cr-rich corundum, eclogite facies cumulates, Pohorje Massif, Eastern Alps