

Cordierite-bearing granitic rocks in South America: Contrasting sources and conditions of formation

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Mineralogy, geochemistry and isotopic data for Ediacaran, Ordovician to Devonian, and Upper Triassic cordierite-bearing granitoids respectively from Brazil, Argentina and Chile are discussed here. Syn-collisional Lower to Middle Ordovician, and post-collisional Upper Devonian garnet-free granitoids from Argentina intruded greenschist-to amphibolite-facies metasedimentary rocks. Garnet-bearing and garnet-free monzogranites of the Nanuque Suite, Brazil, intruded high-grade gneisses and migmatites, and in the High Andes Belt, the Los Tilos garnet-free granite was emplaced into an early Permian batholith during an extensional event. Mineralogical, geochemical and isotopic characteristics of the granites from Argentina and Brazil, such as presence of peritectic and (\pm) relict cordierite, low-magnetic susceptibility (MS) values ($0.03\text{--}0.2 \times 10^{-3}$ SI), negative ϵ_{Nd} (-7.3 to -5.0) and high $\epsilon_{18}\text{O}$ zircon values ($>9\text{‰}$), suggest a major aluminous metasedimentary source. Data for the Chilean pluton (small volume, associated with coeval metaluminous granites, low $\epsilon_{18}\text{O}$ zircon values ($6.6\text{--}7.4\text{‰}$), slightly negative ϵ_{Nd} (-4), and high MS values ($1.4\text{--}2.5 \times 10^{-3}$ SI) are compatible with a less-evolved source, possibly a metaluminous granitic rock. P-T magma crystallization conditions of the cordierite-bearing granites from Argentina are $2\text{--}4$ kbar and $630\text{--}720$ °C; and $3.6\text{--}4.0$ kbar and $670\text{--}700$ °C for their cordierite. The Nanuque magma formed $P > 6$ kbar; $T = 750\text{--}800$ °C, and magma emplaced at ~ 3 kbar. Their cordierite formed at $P = 5.0\text{--}5.2$ kbar

and $T = 720\text{--}740\text{ }^{\circ}\text{C}$. P-T conditions of the Los Tilos magma emplacement are $P \approx 3\text{ kbar}$ and $T \approx 670\text{ }^{\circ}\text{C}$. Cordierite-paramorph α -quartz nodules in this pluton, surrounded by leucocratic rims, have been formed by biotite dehydration reactions. This study confirms that cordierite in granites can be produced from different source rocks by a number of processes, at different P-T conditions.