

Phase equilibria Thermobarometry of Grenvillian granulites from Oaxacan Complex (Mexico)

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Amalgamation of Rodinia (late Mesoproterozoic-early Neoproterozoic) ended with the Grenvillian Orogeny and age-equivalent collision events. The Oaxacan Complex (OC) is the largest outcrop (6,600 km²) of Grenvillian age granulite-facies metamorphic rocks from the Mexican, Zapotecan event [1]. Outcrops locate between Ayoquezco de Aldama and San Baltazar Loxicha (S. Oaxaca State, México). Classic geothermobarometry gives a highly scattered range related probably to resetting during slow cooling, although peaks appear at P (7.5-8.8 kbar) and T (670-810 °C).

Phase equilibria modeling with Theriak-Domino [3] in mafic orthogneisses with g-opx-cpx-hbl-pl-q-ilm using recent a-X models for metabasites [2] suggests equilibration of OC granulites at conditions near the dry-solidus, at P (8-10 kbar) and a more restricted T range (850-875 °C) on comparison of observed vs. calculated mineral modal (vol%) data. Alternative models imposing water-saturated solidus conditions are not compatible with preservation of granulitic peak assemblages. In this case those appear at super-solidus conditions at (8-10 kbar. and 825-1000°), but in presence of melt, extensive retrogression occurs to hbl-plg-ilm-q±bi amphibolite-facies assemblages. The modeling thus suggests that either the gabbroic protholit of OC granulites intruded and crystallized under almost dry conditions or, if water was present, extensive melt-loss must have occurred in order to preserve the observed granulite-facies assemblages.

[1] Solari et al., (2003) TP, 365, 257-282. [2] Green et al. (2016) JMG 34, 845-869. [3] de Capitani, C., Petrakakis, K. (2010) AM 95, 1006-1016.