Mineralogy and Thermobarometry of Xenoliths in Basalt from the Chanthaburi-Trat Gem Fields, Thailand

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Abstract : In the Chanthaburi-Trat basalts, xenoliths are composed of essentially ultramafic xenoliths (particularly spinel lherzolite) with a few of an aggregate of feldspar. Some 19 ultramafic xenoliths were collected from 13 different locations. They range in size from 3.5 to 60mm across. Most are weathered and oxidized on the surface but fresh samples are obtained from cut surfaces. Chemical analyses were performed on carbon-coated polished thin sections using a fully automated CAMECA SX-50 electron microprobe (EMPA) in wavelength-dispersive mode. In thin section, they are seen to consist of variable amounts of olivine, clinopyroxene, orthopyroxene with minor spinel and plagioclase, and are classed as lherzolite. Modal compositions of the ultramafic nodules vary with olivine (60-75%), clinopyroxene (20-30%), orthopyroxene (0-15%), minor spinel (1-3%) and plagioclase (<1%). The essential minerals form an equigranular, medium- to coarse-grained, granoblastic texture, and all are in mutual contact indicating attainment of equilibrium. Reaction rims are common along the nodule margins and in some are also present along grain boundaries. Zoning occurs in clinopyroxene, and to a lesser extent in orthopyroxene. The homogeneity of mineral compositions in lherzolite xenoliths suggests the attainment of equilibrium. The equilibration temperatures of these xenoliths are estimated to be in the range of 973 to 1063°C. Pressure estimates are not so easily obtained because no suitable barometer exists for garnet-free lherzolites and so an indirect method was used. The general mineral assemblage of the lherzolite xenoliths and the absence of garnet indicate a pressure range of approximately 12–19kbar, which is equivalent to depths approximately of 38 to 60km.

Keywords : chanthaburi-trat basalts, spinel lherzolite, xenoliths, 973 to 1063°C, 38 to 60km
Conference Title : ICGS 2019 : International Conference on Geological Sciences
Conference Location : Vienna, Austria
Conference Dates : June 20-21, 2019

Open Science Index, Geotechnical and Geological Engineering Vol:13, No:06, 2019 publications.waset.org/abstracts/92834/pdf