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Universe Clinopyroxene barometer -recalibrations on the results of the orthopyroxene thermobarometry and experimental results and applications to the clinopyroxene geotherms

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The internal exchange of Jd-Di components on clinopyroxene allow to calibrate the universal clinopyroxene thermobarometer (Ashchepkov, 2001; 2002; 2003) based on experimental data for different systems including peridotitic, eclogitic and igneous which are represented by the augite cumulates as well as salites from the basic granulates from low crust. The equation to the peridotitic system was calibrated on the results of the othopyroxene thermobarometry (Brey. Kohler,1990- McGregor,1974). Modifications allow receiving the better agreement with the orthopyroxene estimates and results of polymineral thermobarometry (Brey, Kohler, 1990) as well as the clinopyroxene thermobarometry (Nimis, Taylor, 2000).
The following equation allows working with the peridotite of the mantle lithosphere beneath cratons (30-80) kbar.
P(Ash2009)=0.32 (1-0.2*Na/Al+0.012*Fe/Na)*Kd$\hat{}$(3/4)*ToK/(1+Fe)-35*ln(1273/ToK)*(Al+Ti+2.5Na+1.5Fe3+)+(0.9-CaO)*10+Na20/Al2O3*ToK /200
with the second iteration P=(0.0000002* P$\hat{4}$ +0.000002+P$\hat{3}$-0.0027*P$\hat{2}$+1.2241*P)
Checking of the HP experiments (Brey et al 2008, Walter, 1998; Falloon, Green, 1989; Dasgupta et al., 2007 etc.) it show the precision close to those of the best barometers (McGregor, 1974) $\tilde{5}$-7 but much more wider compositional range including metasomatic associations and
The equation for the Al – rich assemblages allow to obtain the pressure estimates fro the megacrystalls and Al – rich peridotitic clinopyroxenes from the mantle xenoliths carried by alkaline basalts:
P(Ash2009)=0.035*Kd*ToK(1+2.44Fe)-50.2 ln(1273/ToK) (Al+Ti+Na)
Together with the clinopyroxene thermometer (Nimis, Taylor, 2000) it produces the TP estimates very close to those obtained with (Brey, Kohler, 1990) and values of experiments for the melting of basalts. The meagacrystalls show the polybaric origin and their range of estimated pressure corresponds well to determined for mantle peridotites and pyroxenites.
The clinopyroxene geotherms for S. Africa (Boyd, Nixon, 1974), Siberia (Boyd et al., 1997) and North America (Kopylova et al., 1998) are reproducing the TP estimates b set the values for all mantle associations simultaneously. Such geotherms show the complex nature and wide ranges for TP gradients and variations of temperatures at the same level for the large pipes. This I results of the joining subduction, conductive and advective TP of several melts portions passed through the mantle columns. The vast heating and metasomatic modifications were manly produced by the
The eclogite geotherms for the kimberlites reveal two branches – LT close to subduction and HT close to the TP path pf protokimberlites determined by megacrystalline assemblages.
The TP values for the typical subduction eclogites (Dora Maira, East China, Tibet) reveal the range of pressures from 11 to 45 kbars and varying gradients mostly close to LT subduction type. The exact values are highly dependent on the thermometer used. The Krough, 1988 and slightly modified (Nimis, Taylor , 2000) give comparable results. Grant RBRF 05-05-64718.