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The Universal Cpx Jd-Di barometer for mantle peridotite eclogite and pyroxenites and it using for the mantle petrology

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The Jd-Di exchange in clinopyroxenes used for the calibration of pyroxene barometer (Ashchepkov, 2000;2002; Ashchepkov et al 2010;2011;2012) was transformed to make one universal equation for mantle peridotite eclogites and pyroxenites.

The original barometer (Ashchepkov, 2002) calibrated on pressures produced by Opx barometry (McGregor , 1974) was transformed (Ashchepkov et al ., 2004; 2010; 2011) to satisfy the increasing data bases for the mantle xenoliths and experimental values 530 in peridotitic and 650 in elcogitic systems . The obtained difference Pd =Pcpx- Pexp were studied for the dependence on each component and their combination . Instead of the common activities we used the temperature-dependent empirical equations. The three separate equations for the common peridotites, pyroxenites and eclogites (Ashchepkov et al., 2010) were checked and complex To and Al-Na-Fe dependent universal coefficients were received.

The KD is determined as follows:

KD=Na/AlCr*Mg/Ca

The logarithmic dependence between P and KD was transformed to a linear one. Final pressure equations are:

AlCr=(Al-0.01) *((T-600)/700)**0.75+Cr*(ToK-100)/1000+(4*Ti-0.0125)/ (T0-801)*650 +0.55*((Fe-0.23) *(T0-900)/10000-K)

P=0.26*(5+12*(Al+0.30*Na)KD* ToK**0.75 /(1+Fe+ Fe*(ToK-600)/1000)-ln(1273/ ToK))*40*(7*Na-Al-15*Ti+10*Cr+Mg/4)+7.5*Si-20*(Al*Na*Mg/Ca/(Al-2*Ti+Na-2*Fe/(Fe+Mg))+50*(Na+0.1*Al-2*Ti+0.05*Mg-0.22*Ca-0.7*Na)/Ca).

Obtained equation in combination with the (Nimis,Taylor, 2000) thermometer allow to reconstruct position of the magma feeder systems of the alkali basaltic magma withing the mantle diapirs in modern platforms like in Vitim plateau (Ashchepkov et al., 2011) and now was applicated to reconstruct the deep seated magma conduits beneath the mountain collision systems, island arcs ocean plateaus etc.

This equation allows to receive the positions of the major groups of eclogites mantle sections and to find out the regularities of their behavior. The Fe rich eclogites commonly trace he boundary between the lower upper part of subcontinental lithospheric mantle (SCLM) at 3 -4 GPa marking pyroxenite eclogites layer. Ca- rich eclogites and especially grospydites in SCLM beneath Precambrian kimberlites occurs near pyroxenite layer but in younger mantle sections they became common in the lower parts marking presence of the subducted sediments. The Mg Cr- less group eclogites commonly diamondiferous and referring to the ancient island arc complexes are also common in the middle part of mantle sections and near 5-6 GPa. The group is often dominated in the young kimberlites and sometimes is highly diamondiferous. Commonly P-Fe# for eclogites in the lower SCLM part show rising Fe# with decreasing pressures which very of then reflect the differentiation of the magmatic systems commonly rather significant. Commonly the Fe#-values for the eclogites show that they can't be simple subucted oceanic basalts but material remelted not only during the low angle "hot"subduction but also under the influence of the kimberlite melts including protokimberlite magmas. The Mg – rich and Fe rich pyroxenites also show the extending in pressures trends which suggest the anatexic melting under the influence of volatiles or under the plum magma hybridization.

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