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Single grain estimations of oxygen fugacity in subcratonic mantle lithosphere using compositions of Ilmenite, Chromite , Garnet and Pyroxenes.

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Calculated oxygen fugacity conditions for ilmenites and chromites were obtained using the monomineral version of the Taylor (1998) oxygen barometers with the calculation of Fe#Ol according to (Ashchepkov et al., 2010). The monomineral version of the Gar- Ol- Opx method (Gudmundsson & Wood, 1995) was obtained using the regression between FO_2 and Fe3 in garnet and additional correlation to P and T.
F5=Fe#Gar/FeGar; Fo2= 2030.2*Ff5**3-1061.4*F5**2+190.89*F5-12.644
Fo2 = (Fo2-0.01*P (kbar)+(ToC-500)/(3500 -05.)*0.9
The obtained values wee regression and the new Cpx method constructed by the cross correlations of the Fe3+ in Cpx with the oxygen fugacity values obtained for garnets were used for the additional characterization of the mantle SCLM section.
The statistical between regression obtained from the work (Gudmundsson, Wood , 1995) and corrections for the temperature and pressure justified by the comparisons obtained with the Ol- Sp and Ilm- Ol oxybarometers (Taylor et al., 1998) allow to estimate the FO_2 (Δ log QMF) by following simple equations:
For clinopyroxene the cross calibration allow to receive the following regression.
Fo2=-186.71*Fe3**2+48.617*Fe3 - 2.3262; Fo2 = Fo2+(T0-500)/3500-0.01*P
Fo2 = (Fo2-0.01*P (kbar)+(ToC-500)/3500 -05.)*0.7
For clinopyroxene the cross calibration allow to receive the following regression.
Fo2=-186.71*Fe3**2+48.617*Fe3 - 2.3262; Fo2 = Fo2+(T0-500)/3500-0.01*P
Fo2=(Fo2-0.5)*0.8
For the orthopyroxene the correlating with the CPx parameter was calculated as following
The Fe3'Opx was corrected as Fe3Opx-0.03;Fo2=23.882*Fe3'Opx*(Fe1*15)**2-1.8805
Fo2= Fo2+((T0-400)/1000)*(Fe1*20)-0.0175*P; Fo2=(Fo2*(Fe1*15)**2-0.9*P/70)*0.9
Fo2=(Fo2-0.5)*0.9
Despite on the rather low resolution of the Fe3+ EPMA estimates statistically the determined parameters are rather useful and mark major levels in the SCLM beneath Siberian and other cratons. The rise of FO_2 is marked in the three major intervals - in the lithosphere base near the base of lithosphere marking cumulates and shearing peridotites. Near the boundary of the upper and lower mantle at 40 kbar marking so called pyroxenite layer and within basaltic trap – cresponding to the level of water bearing malt interaction , Despite there several layer corresponding to the mantle layering and levels of polybaric hydraulic shearing coused by the protokimberlite melt intrusion. The garnets commonly give some additional trends of joined rising of Fo2 and decreasing of the pressures. There amount in the lower part of the mantle columns is reaching 5-6 units. They are very often correlating with the values determined for the Cpx but later are generally more oxidized. The diamond bearing associations including eclogites are commonly less oxidized belonging to the diamond stability field found by (McCammon et al ., 2001) . Sometimes these values are as low as -5.5 log u. Δ log QMF.
Interesting feature the upper part of the SCLM is sometimes less oxidized then pyroxenite lens and even lower part of SCLM.
The trends of the ilmenites commonly are just marking the line of diamong stability in DSCLM od became higher and (even SCLM) in the upper part . The Ti- bearing spinel are commonly marking slightly lower values then ilmenites while Ti-less chromites are commonly less oxidized marking major units in mantle layering. RBRF grant 11-05-00060.