



Monomineral Cr-Spinel thermobarometry for kimberlite peridotite xenoliths and concentrates.

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New version of the mantle monomineral thermobarometer for Cr- spinels was calibrated on the PT values obtained with the single grain OPx (Brey-Kohler, 1990 – McGregor,1974) method. The pressure was determined as $P(\text{kbar}) = (\text{Cr}/(\text{Cr} + \text{Al} + \text{Fe}^{3+}) / 14 + 0.1 * \text{Ti}) * 0.867 (f.u)$ with the second approximation $P = -0.0053 * P^2 + 1.1292 * P + 5.8059$ what gives good correlation ($R^2 = 0.95$) with the Opx pressure estimates.

The T values were calculated with the modified equation after (O'Neil- Wood, 1987) where Fe in Ol is found as $\text{Fe} = 0.095 + 0.00 * P$ for $P < 30$ kbar what refer to Ga-Sp lherzolites and $\text{Fe} = 0.06 + 0.0005 * P$ for peridotites from deeper horizons. It was found using the average tendency using more then 2000 mantle kimberlite peridotite xenoliths. The correlation between Ol-Sp and Sp temperatures is lineal ($R^2 = 0.98$)

The correlations of TP values were obtained with the original computer program ter5n5n3e counting 45 temperature and 36 pressure methods allowing covariations of TP and mineral compositions.

The Cr-Spinel TP method quite agree with the monomineral estimates using OPx (BK90Opx-Mg74), CPx (Nimis Taylor -Ashchepkov, 2001,2003) and new garnet thermobarometry. (Ashchepkov2003, Ashchepkov, Vishnyakova,2004). The geotherms determined for 12 pipes from Siberian platforms (Aykhmal, Interna-

tional'naya, Ossennaya, Zapolyarnaya , Yubileanaya , Sytykanskaya etc) and several World localities using published data for North and South America , Africa, Fennoscandia, etc (Lithos, v.77; Proceedings 7IKC) and original mineral analyses (more then 14000 EPMA estimates) show quite good agreements for all analyzed kimberlite pipes.

The combination of PT values for different mineral concentrates allow to suggest the mantle lithology. Usually the determined pressures for Cr- spinels are less 60kbar except for the diamond inclusions though there are localities where HT (>1200oC) estimates are common. The deep Ol-Gar coarse grained horizon (Pokhilenko et al, 1991) and sheared peridotites (Nixon Boyd ., 1973) usually are not reflected on the TP spinel diagrams. Cr- Spinel for some mantle columns beneath kimberlite pipes give slightly colder conditions then Cr- diopside and Opx-based estimates. But hot conditions found with Cr-method are common for pyroxenite horizons near 40kbar, around Ga-Sp transitions and at the basements of the continental lithosphere and crust.

Method gives very good estimate for the placer for example Tyradak (Siberia) (Griffin et al., 1997) and may be used for the prospecting of kimberlites and for the mantle reconstructions. Grants RBRF 99-05-65688, 03-05-64146; Agreements ALROSA-UIGGM 77-02; 65-03;02-05.