

# Origins of majoritic inclusions in diamond

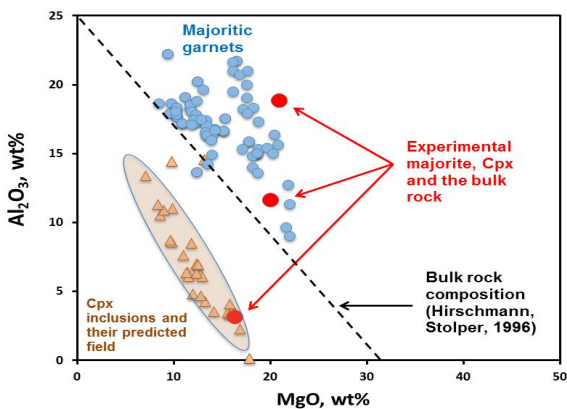
EKATERINA S. KISEEVA<sup>1</sup>, BERNARD J. WOOD<sup>1</sup> AND SUJOY GHOSH<sup>2</sup>

<sup>1</sup>University of Oxford, Department of Earth Sciences Oxford OX1 3AN, UK (berniew@earth.ox.ac.uk)

<sup>2</sup>ETH, Zurich

As pressures increase above ~7-8 GPa pyroxene components gradually dissolve as “majorite” into the garnet structure. Two majoritic garnet endmembers:  $\text{Na}_2\text{MgSi}_5\text{O}_{12}$  and  $\text{Mg}_2\text{Si}_2\text{O}_6$  can be distinguished for eclogitic and peridotitic parageneses, respectively. Based on these substitutions we recently showed [1] that the majority of reported majoritic inclusions in diamonds actually belong to an intermediate lithology which we argued is pyroxenitic.

Here we elaborate on the origin and composition of the pyroxenite lithology. According to the geobarometer of [2] most of majoritic inclusions formed at mantle transition zone pressures, predominantly within the stability field of clinopyroxene. Using experimental partition coefficients for Na, Al, Mg and Fe between majorite and clinopyroxene, we can calculate the compositions of clinopyroxene in equilibrium with the majoritic garnet, which allows us calculate the locus of possible bulk compositions. These lie across the field of upper mantle pyroxenites defined by Hirschmann and Stolper [3]. We also find that clinopyroxene inclusions in diamond which coexist with majoritic garnet inclusions are all close to those predicted by our study. Experimental tests generate majorite and clinopyroxene of appropriate composition from pyroxenite starting materials.



[1] Kiseeva E.S et al(2013) *Geology* doi:10.1130/G34311.1 [2] Collerson, K.D. et al (2010) *Geochim. Cosmochim Acta* **74** 5939–5957 [3] Hirschmann, M.M., Stolper, E.M. (1996) *Contrib Mineral Petrol* 124:185-208