

Petrogenesis of eclogite and mafic
granulite xenoliths from South
Australian Jurassic kimberlitic
intrusions: Tectonic Implications

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PETROGENESIS OF ECLOGITE AND MAFIC GRANULITE XENOLITHS FROM SOUTH AUSTRALIAN JURASSIC KIMBERLITIC INTRUSIONS: TECTONIC IMPLICATIONS

ANGASTON, EL ALAMEIN AND PITCAIRN ECLOGITES AND MAFIC GRANULITES

ABSTRACT

Jurassic kimberlites in South Australia have entrained sub lithospheric mafic granulites and eclogites from the eastern margin of the Australian Craton. This thesis looks at these rocks as a unique window into the sub-lithospheric mantle beneath the south eastern margin of Gondwana. Samples collected from Angaston, El Alamein and Pitcairn included eclogites, amphibole eclogites, amphibole granulites and feldspar rich granulites. These samples were prepared for analytical work at the University of Adelaide. Whole rock geochemistry was collected from x-ray fluorescence in the Mawson Laboratories. Mineral identification and geochemistry was determined by the Cameca SX 51 microprobe at Adelaide Microscopy. Geothermobarometry showed pressures between 6-30kbar, which represent 15-90km of depth and temperatures between 620-1200°C. These rocks experience very high pressure and temperatures and show petrological evidence of isobaric cooling path from the adiabat to the stable geotherm. Magma crystallisation models using MELTS program helped to determine the protoliths that appear to represent mafic underplates. The cumulate and melts that make up these xenoliths have been shown in this thesis to most likely have been derived from a MORB source that crystallised at high pressures (up to 30kbar). Pseudosections produced with the Theriak-Domino program were used to produce a metamorphic path and show that rock type is closely linked to emplacement depth and bulk composition. Radiogenic dating using Neodymium and Samarium system created isochron's using IsoPlot and gave ages supporting protolith emplacement during the Neoproterozoic (≈ 670 Ma) around the breakup Rodinia.

KEYWORDS: ECLOGITES, GRANULITES, EMAC, PETEROGENESIS AND METAMORPHISM

TABLE OF CONTENTS

Angaston, El Alamein and Pitcairn Eclogites and Mafic Granulites	1
Abstract.....	1
Keywords: Eclogites, granulites, EMAC, Peterogenesis and metamorphism.....	1
List of Figures and Tables	3
Introduction	8
Background.....	10
Setting.....	Error! Bookmark not defined.
Petrology.....	14
Methods	22
Observations and Results.....	23
Discussion.....	47
Conclusions	58
References	60
Appendix A: Methods	64
Appendix B Average garnet and clinopyroxene data (see extended appendix for all data)	66
appendix C Hand Sample descriptions.....	68
appendix DThinsection Descriptions.....	69

LIST OF FIGURES AND TABLES

Figures

Figure 1 Location map for the xenoliths which also shows locations of relevant locations for this thesis such as the Australian Craton, Tasman line and Kayrunnera xenoliths. Map adapted from Tappert et al (2011).	9
Figure 2 Modal percentages of minerals garnet (Gt), pyroxene (Px) and Feldspar (Fd) for the South Australian xenoliths. Xenoliths are distinguished by rock type in Figure 2.A and location of kimberlitic pipe with the two areas being El Alamein and Pitcairn in Figure 2.b. The rock type definitions are found in table 1	15
Figure 3 Photomicrographs of the three main types of textural xenoliths from Angaston, El Alamein and Pitcairn. Image A shows the common eclogitic texture such as triple points in plain polarised light (PPL) (Ai) and cross Polarised light (CPL) (Aii) in sample PA 6x2, Image B shows the common granulite texture and the main metamorphic reaction that defines these suites of mafic rocks in PPL and CPL (Bii) in sample Pit-M25, Image C shows gabbroic texture of xenoliths within a matrix of fine grained plagioclase and pyroxene in PPL (Ci) and CPL (Cii) in sample PA 7x9.....	17
Figure 4 Photomicrographs of important textures found within the studied xenoliths. Image (A) shows the metamorphic reaction plagioclase + pyroxene \leftrightarrow garnet + quartz as seen at El Alamein. Exsolution features such as vermicular exsolution of clinopyroxene of garnet and orthopyroxene exsolution of clinopyroxene in plane polarised light (PPL) (Ai) and cross polarised light (CPL) in sample PA 7x1. Image (B) shows garnet mineral relationships within the granulites in the Pitcairn xenoliths. Garnets form as blebs around pyroxene in PPL (Bi) and CPL (Bii) in sample JS Kim. Image (C) shows the metamorphic reaction Plagioclase + pyroxene \leftrightarrow garnet + quartz as seen at El Alamein. Exsolution features such as garnet exsolution of clinopyroxene and orthopyroxene exsolution of clinopyroxene in PPL and CPL (Cii) in sample PA 7x1.	20
Figure 5 Photomicrograph of orthopyroxene crystal core of a complex corona structure in plane polarised light (PPL) (i) and cross polarised light (CPL) (ii) in sample PA 7x1.	21
Figure 6 Modal percentages of end members for garnet of the South Australian xenoliths. The iron end member is almandine (Al), magnesium end member is pyrope (Py) and calcium end member is grossular (Go), xenoliths are distinguished by rock type in diagram 6a and xenolith location 6b.....	23
Figure 7 Modal percentages of end members for pyroxene of the South Australian xenoliths. The iron end member is Forsterite (Fs), iron calcium end member is Hedenbergite (Hd), magnesium end member is Enstatite (En) and the magnesium calcium end member is diopside (Di). Xenoliths are distinguished by rock type in diagram 6a and xenolith in location 6b.	24
Figure 8 Graph of Jadeite cation % vs pressure. Pressure was calculated using Nimmis and Taylor (2000) clinopyroxene barometer. Data taken from table 2 and table 6.....	25
Figure 9 Modal percentages of end members for feldspars of the South Australian xenoliths. The Sodium end member is albite (Ab), calcium end member is anorthite (An) and potassium end member orthoclase (Or). Xenoliths are distinguished by rock type in diagram 6a and xenolith location 6b.....	25
Figure 10 Plotted amphiboles from Pitcairn xenoliths using A-site occupancy by alkalis (Na + K) vs SiO ₂ to discriminate between the end members (HAWTHORNE <i>et al.</i>	

1997) pargasite (Pa), edenite (Ed), tschermakite (Ts), hornblende (Hb) and tremolite (Tr).....	26
Figure 11 Alkalis (Na ₂ O + K ₂ O) vs SiO ₂ whole rock geochemistry for the xenoliths plotted using IgPet (Carr 2002). Rock type boundaries described by Cox et al (1979). The South Australian xenoliths plot within the Basaltic region. This shows Angaston (red circles and blue squares) (Segui 2010), El Alamein (yellow crosses) and Pitcairn (green triangles).....	34
Figure 12 (A) Calculated CIPW Norm for the South Australian xenoliths, the proposed classification by Thompson (1984) for basalt based on their normative proportions of nepheline (Ne), olivene (Ov), albite (Ab), hypersthene (Hy) and quartz (Qt). Red circles represent South Australian xenoliths (Segui 2010) which plot within the silica saturated and silica undersaturated portions. Green circles represent MORB (Jenner & O'Neill 2012) which plot in the silica oversaturated and silica saturated parts of the diagram. (B) Mole percent diagram (petrogenetic grid) relevant to variable percent melting (5% to the point where clinopyroxene disappears from the residue) of lherzolite over a pressure range of 0.5 to 3GPa (i.e., about 15-90km depth; pressure shown in bold). Each dashed line at a given pressure represents loci of melt compositions (molar normative) generated by progressive partial melting of lherzolite assemblage (ol + opx + cpx + melt) at that pressure (melt % increasing from left to right on each dashed curve). Each continuous line represents a fixed %melting curve. Also shown is the cpx out line. A lherzolitic source rock will lose cpx to the melt beyond this line. Sources of data: Takahashi and Kushiro (1983), Hirose and Kushiro (1993), and Baker and Stolper (1995). Note that it is mainly schematic and does not take into account the changing source composition that must happen as the melt is removed from the source.	35
Figure 13 Plate of whole rock geochemical graphs of South Australian xenoliths (Segui 2010) with MORB (Jenner & O'Neill 2012) for comparison. Graphs A, B, C and D are MgO vs SiO ₂ , CaO, TiO ₂ and Al ₂ O ₃ respectively. Diamonds on Graph A and B show mineral compositions plagioclase (PLAG), clinopyroxene (CPX), orthopyroxene (OPX) and the mid ocean ridge basalt (MORB) melt composition, with two distinct trends; 1) a trend towards orthopyroxene showing orthopyroxene crystallisation driving the melt and 2) a trend clinopyroxene + plagioclase showing clinopyroxene + plagioclase driving crystallisation. Black arrow shows igneous variation trends, "M" is the direction towards melt differentiation and "C" is towards the cumulates or crystal extracts that must drive the magmatic trend.	36
Figure 14 Graph of barium (Ba) vs wt% MgO for the South Australian xenoliths (Segui 2010) (red circles) with MORB (Jenner & O'Neill 2012) (blue circle). South Australian xenoliths show a several order magnitude higher amounts.....	37
Figure 15 Isochrons calculated using IsoPlot (Ludwig 2003) graphs show ¹⁴³ Nd/ ¹⁴⁴ Nd vs ¹⁴⁷ Sm/ ¹⁴⁴ Nd (A) represents whole rock isotope data for the South Australian xenoliths from Angaston (Segui 2010), El Alamein and Pitcairn and gives an age 739±680Ma. (B) South Australian xenoliths (Segui 2010) (green triangles) and Neoproterozoic Cambrian and South Australian Adelaidean basalts (John Foden, per comms) (Blue diamond's) and gives an age of 656 ± 92Ma.....	39
Figure 16 Pseudosection calculated for Pit M22 (see table 2) using THERIAK-DOMINO program (De Capitani & Petrakakis 2010), for the geologically realistic chemical system SiO ₂ -Al ₂ O ₃ -FeO-Fe ₂ O ₃ -MgO-CaO-Na ₂ O-K ₂ O-H ₂ O-TiO ₂ (NCKFMASHTO). The dataset used compiles the following a-x models which incorporate Fe ³⁺ end-member minerals: garnet, biotite and melt (White <i>et al.</i> 2007),	

orthopyroxene and magnetite (White *et al.* 2002), amphibole (Diener *et al.* 2007), clinopyroxene (Green *et al.* 2007), K-feldspar and plagioclase (Holland & Powell 2003) and ilmenite (White *et al.* 2000). Mn is not considered for the reasons given by White *et al.* (White *et al.* 2007). Blue lines represent major introduction of a mineral to the assemblage (amphibole, garnet and plagioclase), arrow represent direction on pseudosection the mineral labeled is introduced. The introduction of garnet to the assemblage turns to Gabbroic rock to granulite and the loss of plagioclase turns granulite to eclogite. Blue shaded polygon represents the mineral assemblage seen for Pit M22 and the blue star represents the pressure and temperature estimations for the sample (see table 6). 43

Figure 17 Pseudosection calculated for Pit M25 (see table 2) using THERIAK-DOMINO program (De Capitani & Petrakakis 2010), for the geologically realistic chemical system SiO₂-Al₂O₃-FeO-Fe₂O₃-MgO-CaO-Na₂O-K₂O-H₂O-TiO₂ (NCKFMASHTO). The Dataused compiles the following a-x models which incorporate Fe³⁺ end-member minerals: garnet, biotite and melt (White *et al.* 2007), orthopyroxene and magnetite (White *et al.* 2002), amphibole (Diener *et al.* 2007), clinopyroxene (Green *et al.* 2007), K-feldspar and plagioclase (Holland & Powell 2003) and ilmenite (White *et al.* 2000). Mn is not considered for the reasons given by white *et al.* (2007). Red lines represents major introductions of mineral to an assemblage (amphibole, garnet and plagioclase), arrows represent direction on pseudosection the mineral in labeled is introduced. The Introduction of garnet to the assemblage turns Gabbroic rock to granulite and the loss of plagioclase turns granulite to eclogite. Red shaded polygon represents the mineral assemblage seen for Pit M25 and the red star represents the pressure and temperature estimations for the sample (see table 6). 45

Figure 18 Pressure and temperature plot of geothermobarometry estimations for the SEA (O'Reilly & Griffin 1985), EMAC (Pearson & O'REILLY 1991), Monk Hill (Tappert *et al.* 2011), Angaston (Segui 2010) and Pitcairn and El Alamein. Pressure and temperature estimations using garnet-clinopyroxene Fe-Mg thermometer (Ellis & Green 1979, Krogh 1988) and clinopyroxene barometer (Nimis & Taylor 2000). Data for UHP metamorphic rocks Reference) schematic subduction metamorphic path taken from Agard (2009) and subduction data points taken from numerous sources(Gao 1999, Dale 2003, Janak 2004). Arrows right of Monk Hill Geotherm (Tappert *et al.* 2011) show the metamorphic path for the South Australian xenoliths. 47

Figure 19 Ni-Cr (ppm) variation of the South Australian mafic xenoliths (Segui 2010) (red circles) and MORB data (Jenner & O'Neill 2012) (green circles). Trends on this Figure show melt fractionation curves for high pyroxene/olivine (high pressure) (blue line) and lower pyroxene/olivine trends (black line with yellow triangles) and the complimentary cumulate trend for a high pressure (black line with orange circles). Trends created using MELTS (Ghiorso & Sack 1995). The specific chosen starting basalt used was an olivine tholeiite from the Adelaidean Smithton basin in N.W. Tasmania. This was chosen as it clearly had experienced no crustal contamination (John Foden, per comms) 51

Figure 20 % of melt remaining vs Temperature showing melt evolution path (red crossed) and the complimentary solid cumulate path (black dashes) created from the results of MELTS (Ghiorso & Sack 1995) modelling on the specific chosen starting basalt, an olivine tholeiite from the Adelaidean smithton basin in N.W. Tasmania. This was chosen as it clearly had experienced no crustal contamination (John Foden, per comms). The most favourable run made at pressure 8.5 kbar, low water content and

oxygen fugacity of QFM + 1 as seen in the MELTS list. Minerals crystallised orthopyroxene (OPX), clinopyroxene (CPX), spinel (SP) and plagioclase (PLAG) 53

Figure 21 MELTS (Ghiorso & Sack 1995) modelling of the south Australian xenoliths on Wt% MgO vs Wt% CaO (A) and SiO₂ (B). Melt evolution path (blue crosses) and the complimentary solid cumulate path (black dashes) are shown on the diagram. Starting composition is shown to be the orthopyroxenite (sample EA08 6). 54

Tables

Table 1 Distinguishing characteristics for xenoliths different rock types	14
Table 2 Whole rock major element geochemistry collected using XRF	29
Table 3 Whole rock trace element geochemistry collected using XRF	31
Table 4 Radiogenic Isotope data	38
Table 5 Equations used for Geothermobarometry	41
Table 6 Pressure and temperature estimates where T_{EG79} (Ellis & Green 1979), T_{K88} (Krogh 1988) and P_{NT95} (Nimis & Taylor 2000)	44