

THE MOUNTAIN LAKE KIMBERLITIC PIPES OF NW ALBERTA: EXPLORATION, GEOLOGY AND EMPLACEMENT MODEL

Wood, B.D.¹, Scott Smith, B.H.², and de Gasparis, S³

1. Monopros Limited, P.O. Box 2520, Yellowknife, Northwest Territories, X1A 2P8, Canada
2. Scott-Smith Petrology Inc., 2555 Edgemont Boulevard, North Vancouver, British Columbia, V7R 2M9, Canada
3. Palynex Canada 2503 12th Avenue S.W., Calgary, Alberta, T3C 0S3, Canada

Introduction: Mountain Lake (ML) was the first occurrence of kimberlitic rock to be discovered in Alberta. The occurrence was found in 1990 by Monopros Limited, a subsidiary of De Beers Consolidated Mines Ltd. Mountain Lake is located 75 km ENE of Grande Prairie, Alberta, at the western margin of the interior planes of central Canada.

Exploration: Regional surface sediment sampling undertaken in the Peace River Arch area in 1988 identified concentrations of kimberlitic indicator minerals. Follow up work in 1989 indicated the main target was one small topographic high that was later confirmed to be anomalous by an airborne geophysical survey. Monopros recovered the first volcanic rocks from a hand dug pit in 1990 and subsequently conducted ground geophysical surveys as well as trenching, core drilling (1750m, nine holes) and auger drilling to constrain the occurrence. Insignificant quantities of diamonds were recovered from trench and drillcore material, showing that this occurrence is uneconomic. ML contains low abundances of chromite, chrome diopside and garnet. The absence of G10 garnets and the rarity of spinels similar in composition to diamond inclusions, is consistent with the diamond results. In 1995 the Canadian and Alberta Geological Surveys completed two additional core holes (Leckie et al., 1997; also examined in this investigation).

Geological Setting: In the area of ML the Precambrian basement is covered by >2500m of Phanerozoic sediments including >1000m of relatively undisturbed Cretaceous sediments. Most of the sediments were deposited within the Western Interior Seaway, a broad shallow epicontinental sea with migrating shorelines. The ML kimberlitic rocks were emplaced into early late Campanian to Maastrichtian (Wapiti Formation) poorly consolidated sandstones, siltstones, shales and coal formations that formed in a non-marine flood plain or alluvial environment close to the western limit of the seaway during its last overall main regression. The basement in this area lies within the Chinchaga domain of the Rae Province. The Chinchaga formed in the Archaean at 2088-2186 Ma. but may contain older Archaean components.

Main constituents and rock types: The ML bodies are composed of extrusively formed volcanoclastic rocks with two main end member rock types: juvenile-rich and xenocryst- or quartz-rich volcanoclastics. Gradations between the two end members are also present. **The juvenile-rich volcanoclastics** are dominated by altered olivine. Other coarse constituents include rare ultramafic and basement xenoliths. Magmatic selvages coat many of the coarser constituents, especially the olivines. Ubiquitous, but not abundant, small irregular to more rounded juvenile lapilli with no kernel (<10-20mm) occur. The selvages and juvenile lapilli are composed of glassy to serpentine-like material. Some of the lapilli have vesicular textures. This material contains very fine perovskite, spinel, phlogopite, probable apatite and, relatively common, altered possible monticellite. Serpentine and carbonate occur in some lapilli but may be secondary. The compositions of the groundmass spinel (T1 trend), perovskite and mica (9-14 wt.% Al₂O₃, ±1 wt.% TiO₂, 4-8 wt.% FeO) are similar to phlogopites found in archetype kimberlites. The olivines, occurring both as single grains and

within the juvenile lapilli, include anhedral and sometimes rounded macrocrysts (<5mm in size) and euhedral phenocrysts (<1mm). Insufficient evidence could be obtained to apply a strict petrological classification. The observed features are similar to, but not totally characteristic of, kimberlites and there are no features indicating any alternative rock type. These rocks could represent a marginal or more extreme type of kimberlite and, are therefore, referred to as "kimberlitic". The inter-clast matrix is often indeterminate but appears to contain finely comminuted juvenile and clay-like material. The juvenile-rich volcanoclastics locally display bedding (<1-2m thick), which reflects variations in the size and abundance of olivine, xenoliths and the inter-clast matrix. Most bedding appears to be plane parallel and normally graded. Only minor xenocrystic quartz is present. Most of these volcanoclastics can be termed juvenile-rich, lapilli tuffs (>2mm clast size) and coarse ash (<2mm) or more simply olivine tuffs. In contrast, the **xenocryst-rich volcanoclastics** are composed mainly of medium-coarse sand sized grains of quartz (<1mm). These rocks are poor in juvenile material including olivine and are structureless. Ultramafic and basement xenoliths and mantle-derived xenocrysts are rare to absent.

Body size or morphology: The ML volcanics occur in at least two separate bodies, ML South and North (MLS and MLN respectively). MLS forms a pronounced topographic high that measures 400x600-700m (~20 ha.). MLN has no topographic expression and measures about 250x350m (~8ha.). Drilling indicates that MLS is steep sided (~70°) and contains volcanoclastics down to at least 353m. The shape of MLN is less well established and volcanoclastics here occur down to at least 165m.

Internal geology: MLS is composed predominantly of juvenile-rich volcanoclastics. Bedding is well developed below 200m. MLN is composed of structureless quartz-rich, intermediate olivine-quartz, and partly bedded olivine volcanoclastics.

Sediments within and below the volcanoclastic rocks : Country rock sedimentary material is incorporated throughout the volcanoclastic rocks in both bodies but is seldom abundant. Small clasts of varied rock types occur (mostly <1cm, up to 1-2m). These xenoliths consist of mainly mudstone, siltstone, sandstone and organic material including wood. Features such as very complex contacts, which include small scale mixing between the sediments and the host volcanoclastics, show that many of the sediment xenoliths were poorly consolidated when they were incorporated into the volcanoclastic rocks. Within the MLN volcanoclastics larger intersections of disturbed sedimentary material (up to 25m) that are not laterally continuous are interpreted as xenolithic blocks. In addition, up to 50m of sediments were recovered from the drillholes below the volcanoclastics.

Palynology: The Campanian-Maastrichtian boundary has been identified in the country rock sediments at 515-530m asl (~200m depth) at both MLS and MLN. The last marine sediments were deposited at an elevation of about 510m asl. This sequence is consistent with the local stratigraphy and the overall upward regression leading to the cessation of the Western Interior Basin. The sediment xenoliths from within the volcanoclastics, notably including some from the same elevation as the surrounding in situ Campanian marine rocks, were derived from post Campanian, Maastrichtian terrestrial sediments. The volcanoclastic rocks from the two bodies yielded different palynological assemblages. The juvenile-rich volcanoclastics from MLS contain a rather uniform assemblage of non-marine Maastrichtian (or Campanian-Maastrichtian if results cannot be more time specific) microfossils. In contrast to MLS, most the samples of volcanoclastic material from MLN yielded not only Maastrichtian non-marine palynomorphs but also older marine micro-fossils derived from lower Cretaceous sediments. The nature of the palynomorphs in all of the volcanoclastic rocks indicates that

they were very cool (30°-70°C) when they were incorporated into the volcanics. The palynology provides a maximum emplacement age for both bodies of mid-Maastrichtian, probably 68Ma. and also shows that the volcanics erupted into a terrestrial deltaic environment with a tropical climate.

Emplacement model: The two ML bodies require contrasting emplacement models. **MLS:** The formation of this body is considered to be a two stage subaerial process : (1) pipe excavation with the deposition of most of the disrupted country rock material outside the crater, and (2) subsequent rapid pipe infilling predominantly by juvenile-rich volcanoclastics with minor dilution by country rock material, at least in part, by primary pyroclastic airfall processes. The presence of thinly bedded material suggests that some of the material was deposited into standing water such as a crater lake. No diatreme-facies or magmatic material was found. This general model is similar to that proposed for the Fort á la Corne (FALC) kimberlites in Saskatchewan (Scott Smith et al., this volume) which are interpreted as maars. In contrast to FALC rocks, the MLS volcanoclastics contain common fine material and armoured and accretionary lapilli suggesting wet subaerial eruption clouds. **MLN** appears to be a pipe formed by similar processes to MLS but it must have had a different infilling history to explain the much higher proportion of xenocrystic quartz, the common presence of older organic material, the lack of internal structure, and the presence of very large blocks of sediments within the volcanoclastics. It is most likely that the quartz and older palynomorphs were derived from the pipe wall. The thorough mixing of this material with juvenile volcanoclastic material in most, but not all, areas of MLN may result from processes other than pyroclastic ones. When contrasted to MLS, most of the features in MLN can be explained if much of the infilling resulted from secondary resedimentation processes of extra-crater deposits. Although there is no specific evidence to support the suggestion, many of the features could be explained if MLN was an open pipe when MLS erupted and that much of the resedimented and primary material was derived from MLS while MLN remained open. Some of the large deformed sediment blocks in MLN could be derived from the pipe-forming process and/or spalling of an unstable pipe wall. In contrast to the model presented here, Leckie et al. (1997) propose a different model: "that pyroclastic rocks were emplaced into and onto non-marine floodplain sediments of the Wapiti Group over a discrete time interval (<1Ma.). A positive relief volcanic feature was constructed on the floodplain" during the late late Campanian (between 75 and 76 Ma). The evidence presented here contradicts this model.

Conclusions: The ML pipes were the first kimberlitic rocks to be discovered in Alberta. Although the ML pipes were found to be uneconomic, they serve as an excellent case history of exploration and kimberlite emplacement within the Western Interior Basin. The mantle-derived magma type forming the ML bodies is not well established. If these bodies are composed of kimberlite it is a marginal or extreme variety and the term "kimberlitic" is applied to these rocks. The pipe-forming rocks are crater-facies juvenile-rich or xenocryst-rich volcanoclastics (probable tuffs and coarse ash). ML comprises at least two pipe-like bodies which have contrasting internal geology. The two main pipes were presumably excavated by similar processes, which may be maar-like, but were then infilled by different processes: one pipe was infilled mainly by primary pyroclastic material while secondary resedimentation processes may have dominated in the other. Exploration in this area has recently become very active with a new diamondiferous kimberlite field being discovered 350 km to the northwest of ML in the Buffalo Hills area.

Reference

D.A. Leckie, B., Kjarsgaard, et al., 1997, Geology of a late Cretaceous possible kimberlite at Mountain Lake, Alberta - chemistry, petrology, indicator minerals, aeromagnetic signature, age, stratigraphic position and setting: Geological Survey of Canada, Open File 3441.

SEVENTH INTERNATIONAL KIMBERLITE CONFERENCE

Cape Town, April 1998

EXTENDED ABSTRACTS

All extended abstracts in this volume were submitted by the authors in camera ready form. There has been no editing of the extended abstracts and they have not been subject to review. The Organising Committee of the 7th International Kimberlite Conference takes no responsibility for authors' errors and omissions.

SOUTH AFRICA

	Page No
Abdrakhimov, M.Z., Kouznetsova, E.I., Traskin, V.Yu.	1
Abe, N., Arai, S., Yurimoto, H.	4
Afanasiev, V.P., Pokhilenko, N.P., Logvinova, A.M., Yefimova, E.S.	7
Agashev, A.M., Fomin, A.S., Watanabe, T., Pokhilenko, N.P.	9
Agashev, A.M., Watanabe, T., Kuligin, S.S., Pokhilenko, N.P., Orihashi, Y.	11
Ananiev, V.A., Kuligin, S.S., Reimers, L.F., Khlestov, V.V.	14
Andre, L., Shatsky, V.S., De Corte, K., Sobolev, N.V., Navez, J., Jagoutz, E.	17
Andronikov, A.V., Foley, S.F., Melzer, S.	20
Antonyuk, B.P., Mironov, V.P.	23
Araujo, A.L.N., Gaspar, J.C., Bizzi, L.C.	26
Araujo, D.P., Gaspar, J.C., Garg, V.K.	29
Arima, M.	32
Ashchepkov, I., Salters, V., Andre, L.	35
Bailey, L., Helmstaedt, H.H., Peterson, R.C., Mandarin, J.A., Letendre, J.P.	37
Barashkov, Y.P., Talnikova, S.B.	40
Barron, K.M., Logvinova, A.M., Sobolev, N.V.	43
Barron, L.M., Lishmund, S.R., Oakes, G.M., Barron, B.J.	46
Barry, T.L., Kempton, P.D., Saunders, A.D., Windley, B.	49
Barth, M.G., Rudnick, R.L., Spicuzza, M.J., Valley, J.W., Haggerty, S.E.	52
Baumgartner, M.C., Neuhoff, L.	55
Beard, A.D., Mason, P.R.D., Downes, H.	58
Beard, A.D., Milledge, H.J.	61
Bell, D.R., Mofokeng, S.W.	64
Belousova, E.A., Griffin, W.L., O'Reilly, S.Y.	67
Ben Ismail, W., Mainprice, D.	70
Ben Ismail, W., Mainprice, D., Barruoi, G., Boyd, J., Vauchez, A.	73
Berg, G.W.	76
Berg, G.W.	79
Berg, G.W., Carlson, J.A.	81
Berryman, A.K., Stiefenhofer, J., Shee, S.R., Wyatt, B.A.	84
Bizzi, L.A., Pimentel, M.	87
Bordon, V.	89
Bordon, V., Astapenko, V.	90
Bovkun, A.V., Garanin, V.K., Kudriavtseva, G.P., Possukhova, T.V.	91
Bovkun, A.V., Garanin, V.K., Kudriavtseva, G.P., Possukhova, T.V.	94
Bovkun, A.V., Garanin, V.K., Kudriavtseva, G.P., Possukhova, T.V.	97
Boyd, F.R., Pearson, D.G., Mertzman, S.A.	100

Author	Title	Page No's
Brown, J.W., Butcher, A.R.	Textural and Petrological Variation Within the Crater Facies Kimberlite Bodies of the Fort à la Corne Province, Saskatchewan, Canada.	103
Brown, R.W., Gallagher, K., Griffin, W.L., Ryan, C.G., de Wit, M.C.J., Beilou, D.X., Harman, R.	Kimberlites, accelerated erosion and evolution of the lithospheric mantle beneath the Kaapvaal craton during the mid-Cretaceous.	105
Budaev, D.A.	<<Populational>> model of kimberlites: an application to diamondiferous kimberlites of regions with various geodynamic history.	108
Budaev, D.A., Dolgunin, A.V. Fomin, A.S.	An algorithm of kimberlite diamondiferousness estimations.	111
Bulanova, G.P., Griffin, W.L., Kaminsky, F.V., Davies, R., Ryan, C.R., Andrew, A., Spetsius, Z.V., Zakharchenko, O.D.	Diamonds from Zamitsa and Dalnaya kimberlites (Yakutia): Their nature, growth history, and lithospheric mantle source.	113
Bulanova, G.P., Shelkov, D.	Nature of eclogitic diamonds from Yakutian kimberlites: evidence from isotopic composition and sulphide inclusion chemistry.	116
Burgess, R., Phillips, D., Harris, J.W., Robinson, D.N	Antarctic diamonds in South-Eastern Australia? Hints from ⁴⁰ Ar/ ³⁹ Ar Laser probe dating of clinopyroxene inclusions from Copeton diamonds.	119
Burgess, S.R., Harte, B	Tracing Lithosphere Evolution through the analysis of Heterogeneous G9/G10 Garnets in Peridotite Xenoliths.	122
Carlson, J.A. Kirkley, M.B., Thomas, E.M. Hillier, W.D.	Recent major kimberlite discoveries in Canada.	127
Carlson, R.W., Irving, A.J., Hearn, B.C Jr.	Peridotite Xenoliths from the Williams Kimberlite, Montana: Implications for Delamination of the Wyoming Craton Lithosphere	132
Carlson, R.W., Pearson, D.G., Boyd, F.R., Shirey, S.B., Irvine, G., Menzies, A.H., Gurney, J.J.	Regional Age Variation of the Southern African Mantle: Significance for Models of Lithospheric Mantle Formation	135
Carlson, S.M., Hillier, W.D., Hood, C.T., Pryde, R.P., Skelton, D.N	The Buffalo Hills Kimberlite Province, North-central Alberta, Canada.	138
Cartigny, P., Harris, J.W., Javoy, M	Eclogitic, Peridotitic, Metamorphic Diamonds and the Problems of Carbon Recycling.	141
Channer, D.M.deR., Cooper, R.E.C., Kaminsky, F.	The Guaniamo diamond region, Bolivar state, Venezuela: a new kimberlite province.	144
Cherny, S.D., Fomin, A.S., Yanygin, J.T., Banzeruk, V.I., Kornilova, V.P.	Geology and composition of the Nakyn field kimberlite pipes and diamond properties (Yakutia).	147
Chesley, J.T., Rudnick, R.L., Lee, C.-T.	Longevity of Cratonic Mantle Beneath an Active Rift: Re-Os evidence from Xenoliths from the Tanzanian East African Rift.	149
Chinn, I.L., Gurney, J.J., Harte, B., Fitzsimmons, I.C.W., Milledge, H.J	Nitrogen contents of diamond plates: a comparison of FTIR and SIMS analyses	152
Chinn, I.L., McCallum M.E., Harris C., Milledge, H.J., Gurney, J.J.	C02 - bearing diamonds in eclogite xenoliths from the Sloan 2 kimberlite, Colorado	155
Chinn, I.L., Milledge, H.J., Gurney, J.J.	Diamonds and inclusions from Jagersfontein kimberlite	156
Clarke, J., Sobie, P.A., Wilkes, T.A., Zweistra, P	The Geology and Economic evaluations of the Lihobong kimberlites, Lesotho.	158
Cookenboo, H.O.,	Emplacement history of the Jericho kimberlite pipe, northern Canada.	161
Cookenboo, H.O., Kopylova, M.G., Daoud, D.K.	A chemically and texturally distinct layer of diamondiferous eclogite beneath the central Slave craton, northern Canada.	164
Corbett, I.B., McMillan, I.K	From Shore to Shelf and Back Again.	167
Davies, R., Griffin, W.L., Pearson, N.J., Andrew, A., Doyle, B.J., O'Reilly, S.Y.	Diamonds from the Deep: Pipe DO-27, Slave Craton, Canada.	170
Davies, R.M., O'Reilly, S.Y., Griffin, W.L.	Characteristics of Alluvial Diamonds from Bingara and Wellington, Eastern Australia.	173
Davies, R.M., O'Reilly, S.Y., Griffin, W.L.	Dynamic Growth Structures in Diamonds from Bingara, NSW, Australia.	176
Dawson, J.B.	Melting and Metasomatism in Upper Mantle Peridotite Xenoliths from Labait, North-central Tanzania, and contrasting Metasomatic styles in the Tanzanian Lithospheric Mantle.	179
de Bruin, D	Inclusion Bearing Cr-poor and Cr-rich Garnet Megacrysts from the Group II Swartuggens Kimberlite.	181
De Corte, K., Cartigny, P., Shatsky, V.S., De Paepe, P., Soboiev, N.V., Javoy, M.	Microdiamonds from UHP Metamorphic rocks of the Kokchetav Massif, Northern Kazakhstan: FTIR spectroscopy, C & N Isotopes and Morphology.	184
Deines, P	Intra- and Inter-Mineral Oxygen Isotope Variations in Kimberlitic Zircons.	187
Demaiffe, D., El Fadili, S., Andre, L.	Geochemical and isotopic (Sr, Nd) study of eclogite nodules from the Mbujji Mayi kimberlite, Kasai, Congo. Nature of the protoliths and evidence for mantle metasomatism.	190
De Meillon, L., Bristow, J.W	Some Characteristics of High Level Tertiary Age Alluvial Terraces along the Orange River between the towns of Douglas and Prieska, Northern Cape Province, South Africa.	193
De Wit, M.C.J., Morelli, C., Skinner, C.P.	A reinterpretation of the Lichtenburg diamond deposits.	195
Dmitriev, A.N., Dyatlov, V.L., Litasov, K.D.	Physical model of kimberlite pipes formation: new constraints from theory of non-homogenous physical vacuum.	196
Doyle, B.J., Kivi, K., Scott Smith, B.H.	The Tli Kwi Cho (DO27 and DO18) Diamondiferous Kimberlite Complex Slave Craton, Northwest Territories, Canada	199
Edler, E., Winter, F., Edwards, R.	The Rosario do Sul Kimberlitic Province, Rio Grande do Sul State, Southern Brazil.	202
El Fadili, S., Demaiffe, D.	Petrology, mineral chemistry and thermobarometry of eclogite nodules from the Mbujji Mayi kimberlite, Kasai, Congo: significance of kyanite-cpx intergrowths.	205

Erinchev, Y.M., Milshtein, E.D., Saltykov, O.G., Verzhak, V.V.	Local depressions in Country Rock of Kimberlites as a New Exploration Criteria (by the Example of Zolotitsa Field, Arkhangelsk, Russia).	208
Field, M., Scott Smith, B.H.	Near surface emplacement of kimberlites: contrasting models and why.	211
Field, M., Scott Smith, B.H.	Textural and Genetic Classification schemes for kimberlites: a new perspective	214
Foley, S.F., Glaser, S.M., Andronikov, A.V	Non-cratonic garnet peridotites from rifted continental settings in Vitim, Siberia (Baikal Rift and East Antarctica) (Lambert-Amery Rift).	217
Foley, S.F., Musselwhite, D.S., van der Laan, S.R.	Melting processes in veined lithospheric mantle in cratonic and non-cratonic settings.	220
Friese, A.E.W.	Structural control on kimberlite genesis and crustal emplacement within South Africa and the Kaapvaal Craton during the Cretaceous	224
Friese, A.E.W.	Tectonic evolution and intra-cratonic alkaline magmatism within the central Kaapvaal Craton during the Mesoproterozoic.	227
Fung, A.T.	Petrochemistry of upper mantle eclogites from the Grizzly, Leslie, Pigeon and Sable kimberlites in the Slave Province, Canada.	230
Garanin, V.K., Kudriavtseva, G.P., Possukhova, T.V.	Diamonds of Arkhangelsk kimberlite province (review).	233
Garanin, V.K., Kudriavtseva, G.P., Vasilyeva, E.R.	The fundamental study of garnets: application for prospecting and economical estimation of diamond bearing kimberlites.	236
Gaspar, J.C., Araujo, D.P., Melo, M.V.L.C.	Olivine in Carbonatitic and Silicate Rocks in Carbonatite Complexes	239
Gaspar, J.C., Teixeira, N.A., Steele, I.M.	Cathodoluminescence of Juina Diamonds.	242
Gaul, O., O'Reilly, S.Y., Griffin, W.L.	Lithosphere Mapping in Eastern Australia.	245
Geiger, C.A.	Could the Effect of Order-Disorder in Garnet be Important for Upper Mantle Petrology?	248
Gibson, S.A., Thompson, R.N., Dickin, A.P	Subcontinental mantle plume impact and kimberlite genesis.	250
Gimis, A.V., Stachel, T., Brey, G.P. Harris, J.W., Phillips, D.	Internally consistent geothermobarometers for garnet harzburgites.	253
Gonzaga, G.M., Gaspar, J.C., Araujo, D.P.	³ He and ¹⁰ Be Isotopes as a Diamond Exploration Tool: Some thoughts Based on Literature Data	256
Graham, I., Burgess, J.L., Bryan, D., Ravenscroft, P.J., Thomas, E., Doyle, B.J., Hopkins, R., Armstrong, K.A.	The Diavik Kimberlites - Lac de Gras, Northwest Territories, Canada.	259
Graham, S., Lambert, D.D., Shee, S.R., Smith, C.B., Hamilton, R.	Re-Os and Sm-Nd Isotope Systematics of Alkaline Ultramafic Rocks, Xenoliths and Macrocrysts from the Earacheedy Basin, Yilgarn Craton.	262
Graham, S., Lambert, D.D., Smith, Chris.B., Shee, S.R., Reeves, S.J.	Re-Os isotope Systematics of Oxide Xenocrysts and Peridotite Xenoliths from the Kimberlites and the Argyle Lamproite, Kimberley Block, Australia: Implications for the Evolution of the Continental Lithospheric Mantle.	265
Greenwood, J.C., Gibson, S.A., Thompson, R.N., Weska, R.K., Dickin, A.P	Petrogenesis of Cretaceous Kimberlites from the Paranatinga Region, Central Brazil.	268
Griffin, W.L., Doyle, B.J., Ryan, C.G., Pearson, N.J., O'Reilly, S.Y., Natapov, L., Kivi, K., Kretschmar, U., Ward, J.	Lithosphere Structure and Mantle Terranes: Slave Craton, Canada.	271
Griffin, W.L., Win, T.T., Davies, R., Wathanakul, P., Andrew, A., Metcalfe, I.	Diamonds from Myanmar and Thailand: Characteristics and Possible Origins.	274
Grütter, H.S.	Chrome-calcium, Magnesium-number and Yttrium characteristics of garnets in depleted Lherzollitic, Harzburgitic and Dunitic mantles.	277
Grütter, H.S., Apter, D.B	Kimberlite- and lamproite-borne chromite phenocrysts with "diamond-inclusion"-type chemistries.	280
Grütter, H.S., Apter, D.B	Garnet xenocryst chemistries in a traverse from Eendekuil to Kimberley over the south-western margin of the Kaapvaal craton.	283
Grütter, H.S., Quadling, K.E	Some comments on the (ab)use of sodium in garnet to predict eclogitic diamond potential.	287
Gurney J.J., Moore R.O., Bell D.R.	Mineral associations and compositional evolution of Monastery kimberlite megacrysts	290
Haggerty, S.E., Fung, A.T.	Orbicular Oxides in Carbonatitic Kimberlites: High Pressure Autoliths or Low P Liquid Immiscibility?	293
Hamilton, M.A., Pearson, D.G., Stern, R.A., Boyd, F.R.	Constraints on MARID petrogenesis: SHRIMP II U-Pb zircon evidence for pre-eruption metasomatism at Kampfersdam.	296
Harlow, G.E.	Interpretation of Kcpx and CaEs in Clinopyroxene from Diamond Inclusions and Mantle Samples.	299
Harmer, R.E	Carbonatite magmas in the mantle: Evidence and relationship to kimberlites, orangeites and lamproites.	302
Harris, P.D., Courtnege, P.M	The effects of Regolith-Landform development in diamond exploration: spectral investigation.	305
Harte, B., Hutchison, M.T., Lee, M., Harns, J.W	Inclusions of (Mg,Fe)O in Mantle Diamonds	308
Hatton, C.J.	The Difference between Sheared and Granular Peridotites.	311
Hatton, C.J.	The Kimberlite-Megacryst link at Monastery Mine.	314
Hauri, E.H., Pearson, D.G., Bulanova, G.P., Milledge, H.J	Microscale variations in C and N isotopes within mantle diamonds revealed by SIMS.	317
Hauseil, W.D., Kucera, R.E., McCandless, T.E., Gregory, R.W	Mantle-Derived Diatremes in the Southern Green River Basin, Wyoming, USA	320
Heaman, L., Teixeira, N.A., Gobbo, L., Gaspar, J.C.	U-Pb Mantle Zircon Ages for Kimberlites from the Juina Paranatinga Provinces, Brazil.	322

	Title	Page No's
Heaman, L.M., Creaser, R.A., Cookenboo, H.O.	Zircons from eclogite in the Jericho Kimberlite Pipe, northern Canada: Evidence for Proterozoic High Pressure Metamorphism Beneath the Slave Province.	325
Hearn, B.C. Jr	Peridotite xenoliths from Porcupine Dome, Montana, USA: Depleted subcontinental lithosphere samples in an olivine-phlogopite-carbonate magma.	328
Helmstaedt, H.H., Harrap, R.M.	Tectonic Aspects of the Kimberlite - Diamond - Upper-Mantle-Sample Connection: Does a coherent Model evolve?	331
Hutchison, M.T., Cartigny, P., Harris, J.W.	Carbon and Nitrogen Compositions and Cathodoluminescence Characteristics of Transition Zone and Lower Mantle Diamonds from Sao Luiz, Brazil.	336
Ionov, D.A., Griffin, W.L., O'Reilly, S.Y.	Garnet peridotite xenoliths in alkali basalts from Siberia and Mongolia: a comparison of lithospheric mantle compositions in cratonic and younger terrains.	339
Iouchko, N.A., Kremenetsky, A.A., Kouznetsov, I.I.	Nature of Diamonds, Melts and Fluids in the Ring Structures: Endogeneous Explosion vs. Impact Process.	342
Irvine, G.J., Pearson, D.G., Carlson, R.W., Boyd, F.R.	Platinum Group Element Constraints On The Origin Of Cratonic peridotites: A Study Of Kimberley Peridotite Xenoliths.	346
Irving, A.J., Kuehner, S.M.	Petrology and Geochemistry of the Ruby Slipper Lamproite, Western Montana: A Leucite-Bearing, Ultrapotassic Magma in an Eocene Continental Arc.	349
Izraeli, E., Schrauder, M., Navon, O.	On the Connection between Fluid and Mineral-inclusions in Diamonds.	352
Izraeli, E., Wilcock, I.C., Navon, O.	Raman Shifts of Diamond Inclusions - A Possible Barometer.	355
Jacob, D.E., Foley, S.F.	Evidence for Archean Ocean Crust with Island Arc Signature from Diamondiferous Eclogite Xenoliths.	358
Jacob, D.E., Kjarsgaard, B., Horn, I.	Trace element concentrations by Laser Ablation ICP-MS in subcalcic garnets from Saskatchewan and Somerset Island, Canada.	361
Jacob, D.E., Matthey, D.P.	Geochemistry of layered kyanite-bearing eclogites from the Roberts Victor Mine, South Africa.	364
James, D.E., van der Lee, S., Gao, S., Silver, P., VanDecar, J., Kuehnel, R., Jordan, T.H., Saltzer, R., Gaherty, J., Gore, J., Zengeni, T., Nguiri, T., Wright, C., Webb, S., Burford, D., Doucoure, M., Mollisana, M., Green, R., Robey, J., Harvey, J., Kostlin, E., Reichhardt, F.	Review of Seismic Structure of the Continental Lithosphere with Results from the Southern Africa Seismic Experiment	366
Janney, P.E., le Roex, A.P.	Causes of Compositional Diversity in the Olivine Melilitites of Namaqualand-Bushmanland, South Africa.	371
Janney, P.E., le Roex, A.P., Viljoen, K.S.	Trace Element and Isotopic Characteristics of Olivine Melilitites from the Western Cape, South Africa: Implications for the Sources of Group 1 Kimberlites.	374
Janse, A.J.A.	Archons, Protons and Tectons: an update.	377
Johnson, L.H., Burgess, R., Turner, G., Milledge, H.J.	Fluids trapped within diamond: clues to mantle geochemistry.	380
Johnson, L.H., Burgess, R., Turner, G., Milledge, H.J.	Noble gas and halogen systematics of fluids within diamond coats from Canada and Africa.	383
Jones, A.P., Dobson, D., Milledge, H.J., Taniguchi, T., Litvin, Y., Genge, M.J., Rabe, R.	Experiments with low-T potassic carbonatitic melts, fluids and diamonds.	386
Kaminsky, F.V., Gorzynsky, G., Sablukova, L.I., Sablukov, S.M., Zakharchenko, O.D.	Primary Sources of Diamonds in the Birim Area, Ghana.	389
Kaminsky, F.V., Sablukov, S.M., Sablukova, L.I., Shpanov, V.E., Zhuraviev, D.Z.	Diamondiferous Minette Dykes from the Parker Lake Area, N.W.T., Canada.	392
Kaminsky, F.V., Zakharchenko, O.D., Channer, D.M., DeR., Blinova, G.K., Maltsev, K.A.	Diamonds from the Guaniamo area, Venezuela.	395
Kelemen, P.B.	One view on the genesis of cratonic mantle peridotites.	398
Keller, R.A., Remley, D.A., Snyder, G.A., Taylor, L.A., Sobolev, N.V.	Mantle Xenoliths from the Obnazhennaya Kimberlite, Yakutia.	402
Keller, R.A., Taylor, L.A., Snyder, G.A., Sobolev, V.S., Carlson, W.D., Sobolev, N.V., Pokhilenko, N.P.	3-D Petrography of a Diamondiferous Eclogite from Udachnaya, Siberia.	405
Kempton, P.D., Hawkesworth, C.J., Lopez-Escobar, L., Ware, A.J.	Geochemistry of spinel ± garnet hercynite xenoliths from Pali Aike: Implications for evolution of mantle lithosphere beneath southern Patagonia	408
Kent, R.W., Paul, D.K., Basu, A., Ghose, N.C., Kempton, P.D.	Mafic alkaline intrusions in the Damodar Valley, India: the micaceous kimberlite - lamproite connection revisited.	411
Kepezhinskias, K., Kepezhinskias, P.	Ultramafic - Mafic rocks of the Eastern European Craton and Their Diamond Potential.	414
Kepezhinskias, P., Defant, M.J., Maury, R., Clague, A., Joron, J., Cotten, J., Kity, S.J.	Composition of Island-Arc Mantle and its Bearing on the Origin of Cratonic Lithosphere.	417
Kinny, P.J., Trautman, R.L., Griffin, B.J., Harte, B.	Airborne Electromagnetic and Magnetic Surveying in the Search for Kimberlites.	420
Kinzler, F.J., Grove, T.L.	Carbon isotopic analyses of microdiamonds.	423
	Origin of Depleted Cratonic Harzburgite by Deep Fractional Melt Extraction and Shallow Olivine Cumulate Infusion.	426

Kirkley, M.B., Kotebaba, M.R., Carlson, J.A., Gonzales, A.M., Dyck, D.R., Dierker, C., Kiviets, G., Phillips, D., Shee, S.R., Vercoe, S.C., Barton, E.S., Smith, C.B., Fournie, L.F., Kjarsgaard, B.	Kimberlite Emplacement Processes Interpreted from Lac de Gras Examples. 40Ar/39Ar Dating of yimengite from the Turkey Well kimberlite, Australia: The oldest and the rarest. Compositional trends of spinel and mica in alkali minettes, southern Alberta, Canada.	429 432 435
Klemme, S., O'Neill, H.St.C.	The partitioning of Chromium between orthopyroxene and spinel in the system MgO-Al ₂ O ₃ -SiO ₂ -Cr ₂ O ₃ : implications for geothermobarometry for Upper Mantle rocks.	438
Klump, J., Gurney, J.J.	A Pilot Study of the Swartuggens Kimberlite Dyke Swarm.	441
Koga, K.T., Shimizu, N., Grove, T.L.	Disequilibrium trace element re-distribution during garnet to spinel facies transformation.	443
Kong, J.M., Boucher, D.R., Scott-Smith, B.H.	Exploration and Geology of the Attawapiskat kimberlites, James Bay Lowland, Northern Ontario, Canada.	446
Kopylova, M.G., Russell, J.K., Cookenboo, H.	Petrography and Chemistry of the Jericho kimberlite (Slave Craton, Northern Canada).	449
Kopylova, M.G., Russell, J.K., Cookenboo, H.	Upper mantle stratigraphy and thermal regime of the north central Slave Craton, Canada.	452
Kopylova, M.G., Russell, J.K., Cookenboo, H.	Unique chemical features of the peridotitic mantle below the Jericho kimberlite (Slave Craton, Northern Canada).	455
Komilova, V.P., Safronov, A.F., Philipov, N.D., Zayzev, A.I.	The garnet of diamond association in lamprophires from the Anabar massif.	458
Kostrovitsky, S.I., Pavlova, L.A., Suvorova, L.V.	Preliminary information about the first finding of Ti-bearing kirschsteinite (Fe-monticellite) in kimberlites.	460
Kostrovitsky, S.I., de Bruin, D.	Ultramafic association of minerals (garnet-ureyite diopside-chromspinelid) in micaous kimberlites of Yakutian province.	463
Kostrovitsky, S.I., Morikiyo, T.	Sr,Nd isotopic data of kimberlites and related rocks from North of Yakutian kimberlite province (Russia).	466
Kouznetsova, E.I., Galdin, N.E.	Continental lithosphere deep structure researches on the base of scientific deep drilling	469
Kravchenko, S.M.	Kimberlite Types IA, IB, and II as Series from Different Mantle Depths.	471
Kryoshlyk, I.N.	Brief Review of the Theory of Liquid Immiscibility of Kimberlite Magma.	473
Kuehner, S.M., Irving, A.J.	Corundum-kyanite Eclogite, Grosspyrite and Epidote Amphibolite of Probable Subducted Slab Origin from Paleogene Diamondiferous Pipes in SW Wyoming	475
Kukkonen, I.T., Peltonen, P.	Geotherm and a rheological profile for the central Fennoscandian lithosphere.	478
Kuligin, S.S., Pokhilenko, N.P.	Mineralogy of xenoliths of garnet pyroxenites from kimberlite pipes of Siberian Platform.	480
Kurszlaukis, S., Lorenz, V., Zimanowski, B., Büttner, R.	Experiments on explosive interaction of molten kimberlite with injected water.	483
LeCheminant, A.N., Heaman, L.M., Kretschmar, U., LeCouteur, P.C.	Complex Origins and Multiple Ages of Mantle Zircon Megacrysts from Canadian and South African Kimberlites.	486
Lee, C.T.	Are inflected geotherms real?	489
Lee, C.T., Rudnick, R.L.	The origin and demise of cratonic lithosphere: a geochemical perspective from the Tanzanian craton.	492
Leggatt, P.B., Klinkert, P.S.	The application of Airborne Electromagnetic methods in the search for buried Kimberlites and Diamondiferous Gravels.	495
Leluyh, M.I., Kostrovitsky, S.I., Bezborodov, S.M., Nikulin, V.I., Prokopen, S.A., Serov, V.P., Tolstov, A.V., Zuev, V.M.	Kimberlites and related rocks of Anabar region (Yakutia, Russia).	497
Letendre, J., McCandless, T.E., Eastoe, C.J.	Morphology and Carbon Isotope Composition of Microdiamonds from Dachine, French Guiana.	500
Litasov, K.D., Kostrovitsky, S.I., Litasov, Yu.D.	Comparison of ilmenite-clinopyroxene symplectites from Vitim alkaline basalts and Yakutian kimberlites (Siberia, Russia).	503
Litasov, K.D., Litasov, Yu.D.	Reactional and differentiated pyroxenite xenoliths from alkaline basalts of the Vitim volcanic field (East Siberia): their role in metasomatism and position in mantle magmatic system.	506
Litasov, Yu.D., Niida, K., Litasov, K.D.	Reactional modification of the primitive mantle by basaltic melts: an evidence from mantle-derived xenoliths of the Vitim Plateau (Russia).	509
Logvinova, A.M., Fedorova, E.N., Sobolev, N.V.	Microdiamonds from the Yubileynaya kimberlite pipe, Yakutia: morphology, physical properties, and mineral inclusions	512
Luk'yanova, L.I., Lobkova, L.P., Zhukov, V.V., Rybal'chenko, A.Y., Ostroumov, V.P.	Diamonds of the Urals Mobile Belt and Source Rocks for the Uralian (Brazilian) type Diamond Placers.	515
Lütjen, H., Blume, J., Pretorius, C.C.	Geophysical survey over the Elizabeth Bay Mine, Namibia.	518
Mabuza, M., Viljoen, K.S., Majola, S.	New diamond-bearing xenoliths from the Orapa Mine, Botswana.	521
Machin, K.J., Barton E.S.	The petrology of the Rex Mine kimberlite fissures, central Free State, South Africa.	524
Magee, C.W., Taylor, W.R.	Constraints on the history and origin of carbonado from luminescence studies.	527
Mahotkin, I.L.	Petrology of Group 2 Kimberlite - Olivine lamproite (K2L) from the Kostomuksha area, Karelia, N.W. Russia.	529
Mahotkin, I.L., Skinner, E.M.W.	Kimberlites from the Archangelsk region - A rock type transitional between kimberlites, melnoites and lamproites.	532
Mainprice, D., Barruol, G., Ben Ismail, W., Lloyd, G.	Automatic crystal orientation mapping of Kimberlite nodules using electron back scattered diffraction in the scanning electron microscope.	535

	Title	Page No's
Mal'kov, B.A.	The Cosmic Cycles of Kimberlite Volkanism: New Data.	537
Mal'kov, B.A., Malyshev, N.A.	Diamond Occurrences in Kimberlites and Lamproites from Phanerozoic Mobile Belts on Example of the Timans, Urals and Ouachita.	540
Malkovets, V.G., Ionov, D.A., Griffin, W.L., O'Reilly, S.Y., Pokhilenko, N.P., Litasov, K.D.	A-P-T-composition cross-section of spinel and garnet facies lithospheric mantle in the Minusa region SW of the Siberian craton.	543
Marakushev, A.A., Bobrov, A.V.	Crystallization of Eclogite and Pyroxenite Magmas in the Diamond Depth Facies: Evidence from Garnet-Clinopyroxene Association.	546
Mason, P.R.D., Downes, H., Jarvis, K., Vannucci, R.	An investigation of incompatible trace elements in Massif Central mantle xenoliths by laser ablation ICP-MS: a new tool for investigating mantle geochemistry.	549
Massonne, H.J.	A new occurrence of microdiamonds in quartzofeldspathic rocks of the Saxonian Erzgebirge, Germany, and their metamorphic evolution.	552
McCammon, C.A.	Methods for Determination of Fe ³⁺ /SF _e in Microscopic Samples.	555
McCandless, T.E.	Kimberlites: the Products of Deep-Seated Subduction.	558
Mc Dade, P., Harris, J.W.	Syngenetic inclusion bearing diamonds from Letseng-la-Terai, Lesotho.	561
McKinlay, F.T., Scott Smith, B.H., de Gasparis, S., Kong, J.	Geology of the Recently Discovered Hardy Lake Kimberlites, NWT	564
Mendelssohn, M., Milledge, H.J.	Characterisation of diamonds by infrared spectroscopy.	567
Menzies, A.H., Baumgartner, M.C.	Application of garnet geothermobarometry to southern African kimberlites.	570
Menzies, A.H., Gurney, J.J., Harte, B., Hauri, E.	REE patterns in diamond bearing eclogites and diamond bearing peridotites from Newlands Kimberlite	573
Menzies, A.H., Milledge, H.J.M., Gurney, J.J.	Fourier Transform Infra-red (FTIR) Spectroscopy of Newlands diamonds	576
Menzies, A.H., Shirey, S.B., Carlson, R.W., Gurney, J.J.	Re-Os isotope systematics of diamond-bearing eclogites and peridotites from Newlands Kimberlite	579
Mikhailov, M.V., Kuznetsova, M.Yu., Kuzmina, T.S., Polyakov, A.A., Lukyanova, L.I.	New data on potential diamond presence in Western Russia.	582
Milashchev, V.A.	Energy of kimberlite formation.	584
Milledge, H.J., Sutherland, F.L., Kennewell, P.	Further studies of Copeton Diamonds.	587
Milledge, H.J., Woods, P.A., Beard, A.D., Shelkov, D., Willis, B.	Cathodoluminescence of polished carbonado.	589
Miller, A.R., Sellar, M.H., Armitage, A.E., Davis, W.J., Barnett, R.L.	Late Triassic kimberlitic magmatism, western Churchill Structural Province, Canada.	591
Milstein, E.D., Erinchek, Yu.M., Egorkin, A.V., Parasotka, B.S.	The structure of the Lithosphere in Diamond-Bearing Kimberlite Areas. The Siberian Platform.	594
Mironov, V.P.	Internal Morphology of Diamonds from Pipe Udachnaya According to the Data of Luminescence Tomography Method.	597
Mitchell, R.H., Scott Smith, B.H., Larsen, L.M.	Mineralogy of Ultramafic Dikes from the Sarfartoq, Sisimiut and Manlitsoq areas, west Greenland: Kimberlites or Melnoites?	600
Mitioukhine, S.I.	Chief Feature of Rocks of the Earth's crust within Kimberlite Provinces - Moderation of their Petrochemical Indicators.	603
Mitioukhine, S.I., Manakov, A.V., Poltaratskaya, O.L., Romanov, N.N.	New Data about the Structure of the Earth's crust according to Regional Geophysical Investigations' Results within Yakutian Kimberlitic Subprovince.	606
Moser, D.E., Hart, R.J.	Neoproterozoic and Paleoproterozoic re-activation of the crust-mantle transition beneath the central Kaapvaal craton, Lacey kimberlite.	609
Nassichuk, W.W., Dyck, D.R.	Fossils Recovered from Kimberlite Pipes in the Lac de Gras Field, Slave Province, Northwest Canada; Geological Implications.	612
Natapov, L., Griffin, W.L.	Geodynamic controls on the distribution of diamondiferous kimberlites.	615
Navon, O.	Diamond formation in the Earth's mantle	618
Nguno Muatara, A.	Indicator minerals in kimberlites and their respective stream sediments. Gibeon Kimberlite Province, Namibia.	622
Nixon, P.H., Pearson, D.G.	Ultra-magnesian komatiites of phanerozoic age, from SE Spain.	625
Nowell, G.M., Kempton, P.D., Pearson, D.G.	Hf-Nd Isotope Systematics of Kimberlites: Relevance to Terrestrial Hf-Nd systematics.	628
Nowell, G.M., Kempton, P.D., Pearson, D.G.	Trace Element and Isotope Geochemistry of Siberian Kimberlites.	631
Nowell, G.M., Pearson, D.G.	Hf Isotope Constraints on the Genesis of Kimberlitic Megacrysts: Evidence for a Deep Mantle Component in Kimberlites.	634
Nowell, G.M., Pearson, D.G., Kempton, P.D., Irving, A.J., Turner, S.	A Hf Isotope Study of Lamproites: Implications for their Origins and Relationship to Kimberlites	637
Nowell, G.M., Pearson, D.G., Kempton, P.D., Noble, S.R., Smith, C.B.	The source regions/components of kimberlites: Constraints from Hf-Nd isotope systematics.	640
O'Brien, H.E., Tyni, M.	Mineralogy and geochemistry of Kimberlites and related rocks from Finland.	643
O'Reilly, S.Y., Griffin, W.L., Poudjorn Djomani, Y.	Are Lithospheres forever?	646
Pal'yanov, Yu.N., Gusev, V.A., Kupriyanov, I.N., Borzdov, Yu.M., Sokol, A.G., Khokhriakov, A.F., Sobolev, N.V.	The effect of growth rate on formation of nitrogenous defects in diamond.	649
Panina, L.I.	Genesis of Cocites from North Vietnam: Results of Melt Inclusions Studies in Minerals.	652
Panina, L.I., Usoltseva, L.M.	The Role of High-Calcium Alkaline Sulfate-Carbonate Melts in Formation of Melilitite-Monticellite Rocks and Carbonatites of the Malyy Murun Massif (Aldan, Russia).	655

Pearson, D., Carlson, R.W., Boyd, F.R., Shirey, S.B., Nixon, P.H.	Lithospheric mantle growth around cratons: A Re-Os isotope study of peridotite xenoliths from East Griqualand.	658
Pearson, D.G., Shirey, S.B., Bulanova, G.P., Carlson, R.W., Milledge, H.J.	Dating diamonds using the Re - Os isotope technique: A study of sulfide inclusions in Siberian diamonds.	661
Pearson, D.G., Davies, R.M., Shirey, S. B., Carlson, R.W., Griffin, W.L.	The age and origin of eastern Australian diamonds: Re-Os isotope evidence from sulfide inclusions in two diamonds from Wellington, New South Wales.	664
Pearson, D.G., Milledge, H.J.	Diamond growth conditions and preservation: Inferences from trace elements in a large garnet inclusion in a Siberian diamond.	667
Pearson, N.J., Griffin, W.L., Doyle, B.J., O'Reilly, S.Y., van Achterbergh, E., Kivi, K.	Xenoliths from kimberlite pipes of the Lac de Gras area, Slave Craton, Canada.	670
Pearson, N.J., Griffin, W.L., Kaminsky F.Y., van Achterbergh, E., O'Reilly, S.Y.	Trace element discrimination of garnet from diamondiferous kimberlites and lamproites.	673
Peltonen, P.	Silicification of Garnet Peridotite Xenoliths from the Lahtojoki Kimberlite Pipe, Eastern Finland.	676
Peltonen, P., Huhma, H., Tyni, M., Shimizu, N.	Garnet Peridotite Xenoliths from Kimberlites of Finland: Nature of the Lithospheric Mantle at Archaean craton - Palaeoproterozoic mobile belt transition.	678
Pendock, N.	Breaking the Nyquist Barrier: Superresolution Magnetic Imaging from Gradient Data.	681
Pereira, R.S., Wheelock, G., Bizzzi, L., Silva, H., Leite, A.	Alluvial diamond potential of Paleo-Drainage systems in the Headwaters of the Sao Francisco River, Minas Gerais, Brazil	684
Phillips, D., Hams, J.W., Kiviets, G.B., Burgess, R., Fourie, L.F.	40Ar/39Ar Laser Probe Analyses of Clinopyroxene Diamond Inclusions from the Orapa and Mbuyi-Miya Mines.	687
Phillips, D., Kiviets, G.B., Barton, E.S., Smith, C.B., Viljoen, K.S., Fourie, L.F.	40Ar/39Ar Dating of Kimberlites and Related Rocks: Problems and Solutions.	690
Pizzolato, L.A., Schulze, D.J.	Preliminary investigations of megacrysts and peridotite xenoliths from the Kelsey Lake kimberlite, Colorado-Wyoming, USA.	693
Podvysotsky, V.T., Zuev, V.M., Nikulin, V.I., Lelyoukh, M.I., Bezborodov, S.M.	Conception of Formation of Magmatogene and Terrigenous Diamondiferous Formations of Ancient Platforms as the basis of deposits' forecast.	696
Pokhilenko, N.P., McDonald, J.A., Melnyk, W., Hail, A.E., Shimizu, N., Vavilov, M.A., Afanasiev V.P., Reimers, L.F., Irvin, J., Pokhilenko, L.N., Vasilenko, V.B., Kuligin, S.S., Sobolev, N.V.	Kimberlites of Camsell Lake field and some features of construction, and composition of lithosphere roots of southeastern part of Slave Craton, Canada.	699
Pokhilenko, N.P., Sobolev, N.V., Kultgin, S.S., Shimizu, N.	Peculiarities of pyroxenite paragenesis garnets distribution in Yakutian kimberlites and some aspects of the Siberian craton lithospheric mantle evolution.	702
Presnall, D.C., Walter, M.J.	High pressure phase equilibrium constraints on the origin of eclogites.	705
Pretorius, C.C., Blume, J., Lütjen, H., Trofimczyk, K.	Results of Geophysical trials to profile the Kimberlite/Host rock contacts at Venetia Mine and the BK-9 Pipe.	708
Pretorius, W., Barton, J.M., Jr.	The Use of Amphibolite Melting Experiments in Constraining Conditions of Melting in Natural Amphibolite Nodules from the Venetia Kimberlite Pipes.	710
Pretorius, W., Leahy, K.	Implications for diamond prospectivity from comparisons of diamond-bearing lithosphere in two Proterozoic orogenic belts.	713
Prikhodko, V.S., Zemlyanukhin, V.N.	Petrology of spinel Peridotite Xenoliths from Cenozoic Basaltoids in the Khanka Craton's Terrain (East Russia)	716
Pybus, G.Q.J., Hussey, M.C., Linton, P.L.	Spectral investigations of a variety of magnesium-bearing rock types: Implications for kimberlite exploration.	717
Rapp, R.P., Shimizu, N.	Subduction and Slab Melting in the Archean: Experimental Constraints and Implications for Development of Cratonic Lithosphere.	720
Rass, I.T., Gerasimov, V.Yu., Laputina, I.P., Ilupin, I.P.	Diamond occurrence in kimberlites dependent on melting depths and rates of cooling of parental mantle magmas.	723
Rass, I.T., Kravchenko, S.M.	Mellilite-Bearing Rocks within Alkaline-Ultrabasic Complexes: Derivatives from SiO ₂ -Poor, Ca-Rich Mantle Magma?	725
Reid D.L., Cooper A. F.	Carbonatite and silicate magmas at Dicker Willem, southern Namibia : their origin and source region characteristics	727
Reimers, L.F., Pokhilenko, N.P., Yefimova, E.S., Sobolev, N.V.	Ultramafic mantle assemblages from Sytykanskaya kimberlite pipe (Yakutia).	730
Rice, A.	Can the blasting excavation engineering sciences provide insight into the processes of kimberlite emplacement and eruption?	733
Richardson, S.H., Chinn, I.L., Harris, J.W.	Age and Origin of Eclogitic Diamonds from the Jwaneng Kimberlite, Botswana.	734
Robinson, D.N., Ferraris, R., Anderson, V.G., Parker, G.M., Van Blerck, E., Hart, D.	Colour, Morphological and Surface Textural Characteristics of the Diamonds in Venetia Kimberlites.	737
Roden, M.F., Laz'ko, E.E., Jagoutz, E.	Petrology and Geochemistry of Peridotite Inclusions from the Mir kimberlite, Siberia	740
Rodionov, A.S., Viljoen, K.S.	Venetia megacrysts, Northern Province, South Africa.	743
Romashkin, A.I.	Potassium Alkaline Magmatism in the Russian Far East.	746
Romashkin, A.I., Kukhtina, L.M.	Mineralogy of Ingillite.	749
Rombouts, L.	Extreme Value Analysis of Diamond Sizes and Values.	752
Rudnick, R.L., Ireland, T.R., Gahrels, G., Irving, A.J., Chesley, J.T., Hanchar, J.M.	Dating Mantle Metasomatism: U-Pb Geochronology of zircons in cratonic mantle xenoliths from Montana and Tanzania.	754
Ruiz, J., McCandless, T.E., Helmstaedt, H.H.	Eclogites from the Colorado Plateau: A Phanerozoic Record of Subduction beneath North America.	757

Sharygin, V.V., Zaitsev, A.I., Milshtein, E.D.	The model of buried kimberlite field based on its reflection in postkimberlite reservoir rocks (by the example of the Yakutian province).	760
Saparn, G.V., Obyden, S.K., Titkov, S.V.	Use of Cathodoluminescence Scanning Electron Microscope with Color TV Display for Study of Natural Diamonds Internal Structure.	763
Schmitz, M.D., Bowring, S.A., Robey, J.V.A.	Constraining the thermal history of an Archean craton: U-Pb thermochronology of lower crustal xenoliths from the Kaapvaal craton, southern Africa	766
Schulze, D.J., Valley, J.W., Bell, D.R., Spicuzza, M.	Significance of Oxygen Isotope Variations in the Cr-Poor Megacryst Suite.	769
Scott Smith, B.H., Orr, R.G., Robertshaw, P., Avery, R.W.	Geology of the Fort A La Corne Kimberlites, Saskatchewan.	772
Seggie, A.G., Hannweg, G.W., Colgan, E.A., Smith, C.B.	The Geology and Geochemistry of the Venetia Kimberlite cluster, Northern Province, South Africa.	775
Seitz, H.M., Woodland, A.B.	Lithium and Beryllium abundances in peridotitic, pyroxenitic and eclogitic mantle assemblages.	778
Selpe, G.R., Trofimczyk, K.K.	Recent developments in the application of Borehole Geophysical logging techniques in Diamond Mining and exploration - some case studies.	781
Shamshina, E.A., Zaitsev, A.I.	New age of Yakutian kimberlites.	783
Sharygin, V.V.	Melt inclusions and Chromite in Lamproites from Smoky Butte, Montana.	785
Sharygin, V.V., Golovin, A.V., Smirnov, S.Z., Malkovets, V.G.	Relationship between Websterite Xenolith and Host Basanite (Pipe Bele, Khakasia, Russia): Evidence from Fluid and Silicate-Melt Inclusions in Minerals.	788
Sharygin, V.V., Litasov, K.D., Smirnov, S.Z., Kuzmin, D.V., Reutsky, V.N., Ivanov, A.V.	Fluid and Silicate-Melt Inclusions and Interstitial Glass in Mantle Xenoliths from Melanephelinites of the Udokan Lava Plateau, Russia.	791
Sharygin, V.V., Pospelova, L.N.	Sulphide inclusions in Early Lamproite Minerals.	794
Shatsky, V.S., Zedgenizov, D.A., Yefimova, E.S., Rylow, G.M., De Corte, K., Sobolev, N.V.	A comparison of morphology and physical properties of microdiamonds from the mantle and crustal environments.	797
Shee, S.R., Vercoe, S.C., Wyatt, B.A., Campbell, A.N., Colgan, E.A., Hwang, P.H.	Discovery and Geology of the Nabberu Kimberlite Province, Western Australia.	800
Shimizu, N., Pokhilenko, N.P., Boyd, F.R., Pearson, D.G.	Trace element characteristics of garnet dunites/harzburgites, host rocks for Siberian peridotitic diamonds.	803
Shimizu, N., Pokhilenko, N.P., McDonald, J.A.	Geochemical characteristics of the Slave craton lithosphere: A view from heavy mineral concentrate garnets.	805
Shimizu, N., Sobolev, N.V., Yefimova, E.S.	Trace element heterogeneities in-situ diamond inclusion garnets from Siberia	807
Shirey, S.B., Carlson, R.W., Gurney, J.J., van Heerden, L.	Re-Os Isotope Systematics of Eclogites from Roberts Victor: Implications for Diamond Growth and Archean Tectonic Processes.	808
Shiryayev, A.A., Galimov, E.M., Sobolev, N.V., Kolesov, G.M., Zakharchenko, O.D.	Trace Elements in Inclusion-free Diamonds from Venezuela and Arkhangel'sk Deposits.	811
Simakov, S.K.	Garnet - clinopyroxene geobarometry of deep mantle eclogites and eclogite paleogeotherm	814
Skinner, E.M.W., Mahotkin, I.L., Grütter, H.S.	"Mellite" in Kimberlites.	817
Smith, S.C., Ihinger, P.D.	Geochemical evolution of the New England lamprophyre suite: a hotspot signature preserved in the continental crust?	820
Snyder, G.A., Keller, R.A., Taylor, L.A., Remley, D., Halliday, A.N., Sobolev, N.	The Origin of Ultramafic (Group A) Eclogites: Nd & Sr Isotopic Evidence From the Obnazhennaya Kimberlite, Yakutia.	823
Snyder, G.A., Taylor, L.A., Beard, B.L., Halliday, A.N., Sobolev, N.V.	The Diamond-Bearing Mir Eclogites, Yakutia: Nd And Sr Isotopic Evidence for Continental Crustal Input In An Archean Oceanic Environment.	826
Sobolev, N.V., Yefimova, E.S., Channer, D., Anderson, P.F.N., Barron, K.M.	A unique eclogitic source of Guianamo diamonds, Guyana shield, Venezuela.	829
Sobolev, N.V., Yefimova, E.S., Koptil, V.I.	Crystalline Inclusions in Diamonds in the Northeast of the Yakutian Diamondiferous Province.	832
Sobolev, V.N., Taylor, L.A., Snyder, G.A., Jerde, E.A., Neal, C.A., Sobolev, N.V.	Metasomatism of the Mantle Beneath Yakutia: A Quantitative Study of Secondary Chemistry and Mineralogy in Udachnaya Eclogites.	835
Sokolovskiy, A.K., Serokurov, Yu.N., Kalmykov, V.D.	System analysis of remote sensing data on structural control of diamondiferous areas	838
Solovjeva, L.V., Barankevich, V.G., Bayukov, O.A., Glazunov, O.M.	Polychrome olivines in coarse grained lherzolites from the Udachnaya pipe - possible fine indicators of reduced metasomatism	841
Spetsius, Z.V.	Two Generations of Diamonds in the Eclogite Xenoliths.	844
Spetsius, Z.V., Bezborodov, S.M.	Compositional variations and floatability of Kimberlite Ores of Russia	847
Spetsius, Z.V., Griffin, B.J.	Secondary phases associated around diamonds in eclogites from the Udachnaya kimberlite pipe: Implications for diamond genesis.	850
Spetsius, Z.V., Griffin, W.L.	Trace element composition of garnet kelyphites in xenoliths from Udachnaya as evidence of their origin.	853
Spetsius, Z.V., Taylor, W.R., Griffin, B.J.	Major and trace element partitioning between mineral phases in diamondiferous and non-diamondiferous eclogites from the Udachnaya kimberlite pipe, Yakutia.	856
Stachel, T., Harris, J.W., Brey, G.P.	Inclusions in diamonds from Mwadui (Tanzania) - chemical mush in the source.	859
Stachel, T., Viljoen, K.S., Harris, J.W., Brey, G.P.	REE patterns of garnets from diamonds and diamondiferous peridotites - geochemical signatures of the diamond source.	862
Stasiuk, L.D., Lockhart, G.D., Nassichuck, W.W., Carlson, J.A., Tomica, M.	Kimberlite emplacement temperatures derived from the thermal history of Organic matter, Lac de Gras, Canada.	865

R., Hannweg, G.W. St Pierre, M., Wynne, P.J., Counts, B.	The petrology of a mantle xenolith suite from Venetia, South Africa.	868
Sweeney, R.J., Konzett, J., Prozesky, V.M.	Paleomagnetisation of Kimberlites on the BHP/Dia Met Diamond Project.	871
Sweeney, R.J., Winter, F.	The determination of hydrogen in peridotitic minerals by nuclear methods.	874
Tainton, K.M., Seggie, A., Bayly, B.A., Tomlinson, I., Quadling, K.E.	Kimberlite as high-pressure melts: the determination of segregation depth from major element chemistry.	877
Taylor, L.A., Bulanova, G.P., Snyder, G.A., Keller, R.A.	Regional variation in mantle heat flow within the Tanzanian Craton.	880
Taylor, W.R., Bristow, J.	Multiple Inclusions In Diamonds: Evidence For Complex Petrogenesis.	883
Taylor, W.R., Jaques, A.L.	Cyclicality of Continental Alkaline Magmatism in the Geological Record.	886
Taylor, W.R., Kamperman, M., Hamilton, R.	Crystallization history of the Argyle and Ellendale olivine lamproites: constraints from spinel-olivine thermometry and oxygen barometry.	888
Taylor, W.R., Kingdom, L.	New thermometer and oxygen fugacity sensor calibrations for ilmenite- and chromian spinel-bearing peridotitic assemblages.	891
Taylor, W.R., Matveev, S.	Mineralogy of the Jagersfontein kimberlite - an unusual Group I micaceous kimberlite - and a comment on the robustness of the mineralogical definition of 'orangeite'.	892
Taylor, W.R., Nimis, P.	Recalibration of the 5-parameter MRK equation of state for C-O-H fluids under upper mantle conditions and some experimental tests.	895
Taylor, W.R., Reddcliffe, T.H., Jakimowicz, J.	A single-pyroxene thermobarometer for lherzolitic Cr-diopside and its application in diamond exploration.	897
Teixeira, N.A., Gaspar, J.C., Oliveira, A.L.A.M., Bitencourt, R.M., Yeda, B.	Thermobarometry of peridotitic Cr-diopside from the Merlin kimberlites, Northern Territory, Australia - nature of the upper mantle beneath the Proterozoic North Australian craton.	899
Teixeira, N.A., Gaspar, J.C., Weissel, O., Almeida, A.J., Belther, J.A., Gobbo, L.	Morphology of the Juina Maars	902
Thomas, R.D., Novak, N.A., Janse, A.J.A.	Geology of the Juina Diamondiferous Province	905
Titkov, S.V., Bershov, L.V., Scandale, E., Saparin, G.V., Chukichev, M.V., Speransky, A.V.	Diamonds in ultrabasic rock near Wawa, Ontario, Canada.	908
Titkov, S.V., Gorshkov, A.I., Vinokurov, S.F., Bershov, L.V., Solodov, D.I., Sivtsov, A.V.	Nickel Structural Impurities In Natural Diamonds.	911
Tompkins, L.A., Meyer, S.P., Han, Z., Hu, S.	Carbonado from Yakutian diamond deposits (Russia): microinclusions, impurities, and paramagnetic centers.	914
Tompkins, L.A., Taylor, W.R., Ramsay, R.R., Armstrong, R.	Petrology and Geochemistry of Kimberlites from Liaoning and Shandong Provinces, China.	917
Tomshin, M.D., Fomin, A.S., Oleinikov, B.V.	The Mineralogy and Geochemistry of the Kamafugitic Tres Barras Intrusion, Mata da Corda, Minas Gerais, Brazil.	920
Trautman, R.L., Griffin, B.J., Bulanova, G.P.	Basites of the Vilyui - Markha zone (Siberian platform).	923
Tsyganov, V.A., Kontarovich, R.S.	Growth features and nitrogen aggregation properties of microdiamonds derived from kimberlite diatremes.	926
Ulmer, G.C., Grandstaff, D.E., Göbbels, M., Woermann, E.	Target-specific airborne geophysical forecast-exploration technology for diamond deposits <Field - Cluster - Pipe>.	929
Van Achterbergh, E., Griffin, W.L., Shee, S.R., Wyatt, B.A., Sharma, A.L.	An Experimental Delineation of the Oxygen Fugacity of Moissanite (SiC) bearing Silicate Systems	932
Van Achterbergh, E., Griffin, W., Stiefenhofer, J.	Natural Trace Element Distribution Coefficients for Garnet, Clino- and Orthopyroxene: Variations with Temperature and Pressure.	934
Verichev, E.M., Sablukov, S.M., Sablukova, L.I., Zhuravlev, D.Z.	Xenoliths from the Letihakane Kimberlite: Geochemistry and Implications for Mantle Processes.	937
Viljoen, K.S., Phillips, D., Harris, J.W., Robinson, D.N.	A new type of diamondiferous kimberlite of the Zimny Bereg area (pipe named after Vladimir Grib).	940
Vladykin, N.V., Lelyukh, M.I., Tolstov, A.V.	Mineral inclusions in diamonds from the Venetia kimberlites, Northern Province, South Africa.	943
Voinova, I.P., Prikhodko, V.S.	Lamproites of the Anabar region, Northern rimming of the Siberian platform.	946
Vouliko, V.	Post-accretionary stage in the evolution of ultramafic magmatism in accretionary prisms: rock types, diamond potential (on example of East Russia).	949
Ward, J.R., Norman, D.I.	Method of Quantitative Evaluation of Kimberlite Pipes' Productivity.	950
Williams, C.M., Robey, J.v A., Abson, J.P.	Geochemical and Physical Aspects of Diamonds from the Akwatia and Tarkwa Diamondfields in Southern Ghana, West Africa	953
Woermann, E., Göbbels, M., Ulmer, G.C., Grandstaff, D.E.	Petrography and Mineral Chemistry of the Mwenezi-01 Kimberlites, Zimbabwe.	955
Wood, B.D., Scott Smith, B.H., de Gasparis, S.	Moissanite and its bearing on the oxygen fugacity of the deeper regimes of the Earth's upper mantle	958
Woodland, A.B., Peltonen, P.	The Mountain Lake Kimberlitic Pipes of NW Alberta: Exploration, Geology and Emplacement Model.	960
Wyatt, B.A., Ma Wenyun, Li Ziyun, Joyce, J., Colgan, E.A., Smit, D., De Bels, M.	Ferric/Ferrous Iron Contents of Garnet and Clinopyroxene and Calculated Oxygen Fugacities of Peridotite Xenoliths from the Eastern Finland Kimberlite Province.	963
Wyatt, B.A., Morfi, L., Gurney, J.J., Pearson, N.J., Griffin, W.L.	The Ningxiang Lamproites, Hunan Province, China: Petrology and Mineral Chemistry.	965
	Garnets in a Polymict Xenolith from the Bultfontein Mine, South Africa: New Preliminary Geochemical and Textural Data.	968

	Title	Page No's
Wyatt, B.A., Sumpton, J.D.H., Shee, S.R., Smith, T.W	Kimberlites in The Forrest River Area, Kimberley Region, Western Australia.	971
Wyllie, P.J., Lee, W.J.	Kimberlites, carbonatites, peridotites and silicate-carbonate liquid immiscibility explained in parts of the system $\text{CaO}-(\text{Na}_2\text{O}+\text{K}_2\text{O})-(\text{MgO}+\text{FeO})-(\text{SiO}_2+\text{Al}_2\text{O}_3)-\text{CO}_2$	974
Yamashita, H., Anima, M., Ohtani, E.	Melting experiments of kimberlite compositions up to 9GPa: Determination of melt compositions using aggregates of diamond grains.	977
Yao, S., Griffin, W.L., O'Reilly, S.Y	Trace Elements in Chromites from Kimberlites and Related Rocks: Relation to Temperature and Mantle Composition.	980
Yaxley, G.M., Green, D.H.	Phase relations of carbonated eclogite under upper mantle PT conditions - implications for carbonatite petrogenesis.	983
Zack, T., Brumm, R	Ilmenite/liquid partition coefficients of 26 trace elements determined through Ilmenite/cllnopyroxene partitioning in garnet pyroxenites.	986
Zartman, R.E., Richardson, S.H., Gurney, J.J., Moore, R.O.	U-Th-Pb Ages of Megacrystic Zircon from the Monastery Kimberlite, Free State, South Africa.	989
Zhang, A., Griffin, W.L., Ryan, C.G., Andrew, A	Conditions of Diamond Formation beneath the Sino-Korean Craton: Paragenesis, Temperatures and the Isotopic Composition of Carbon.	992
Zhang, Y	Mechanical equilibria in inclusion-host systems	995
Zhao, D., Essene, E.J., Zhang, Y., Pell, J.A	Mantle Xenoliths from the Nikos Kimberlites on Somerset Island, and the Zulu Kimberlites on Brodeur Peninsula, Baffin Island, Canada.	998
Zhao, L., Zhang, P., Huang, X., Li, Y	Deep Mantle Fluids and Their Products in Kimberlites from China.	1001
Zheng, J.	Phanerozoic Evolution of the Subcontinental Lithospheric Mantle, Eastern North China Block: Mantle Xenolith Evidence.	1004
Zichella, V., de Gasparis, A.A., Pendock, N.E.	Mineral mapping with hyperspectral data. A case study over the Moses Rock Dyke and Mule Ear Diatreme (UTAH, USA)	1007
Zintchouk, N	New Data about Crusts of Weathering on Kimberlites of Diamondiferous Territories.	1009
Zintchouk, N.N., Boris, Y.I	Erosional Section of Kimberlite Bodies and the Scales of Placer Diamondiferousness.	1013
Zintchouk, N.N., Boris, Y.I., Stegnitsky, Y.B	Specific Features of Kimberlite Prospecting in Various Landscape-geological Conditions.	1017
Zintchouk, N.N., Dukardt, Y.A., Boris, Y.I	Specific Features of Zoning of Ancient Platforms' Territories According to the Degree of Perspectiveness of Diamondiferous Kimberlites' Intrusion.	1020
Zintchouk, N.N., Koptil, V.I., Boris, Y.I	Ancient Platforms' Diamond Typomorphism (on the example of Siberian Platform).	1024
Zintchouk, N.N., Zuev, V.M., Mitioukhine, S.I	Regional Zoning of Territories According to the Level of Primary Diamond Sources' Diamondiferousness.	1028
Zuev, V.M., Bezborodov, S.M., Chyerny, S.D., Yanygin, Y.T., Molchanov, Y.D	The Structures which Control the Location of Kimberlites of Middle-Markhinsky Region.	1031
Zuev, V.M., Serokurov, Y.N., Kalmykov, V.D	Assessment of Diamondiferous Perspectives of East-European Platform according to the Data of Sounding from Space.	1034
Zweistra, P., Jarvis, W., McGeorge, I.B.	The Geology of Micaceous Kimberlite Intrusives, Khutse, Botswana	1037