

SARM PROGRAM



SARM PROGRAM

SOUTH AFRICAN REFERENCE MATERIALS

*CATALOGUE OF
REFERENCE MATERIALS PRODUCED BY MINTEK*
CATALOGUE 1
NOVEMBER 2006

SARM PROGRAM



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SARM PROGRAM



INTRODUCTION

Reference materials have been made at Mintek since the mid 1970's, throughout this period best practices of the time have been used for manufacture and certification. These reference materials have been sold internationally in many different countries under the brand name SARM, (South African Reference Material). SARM'S have enjoyed prestige and recognition till this day and they can be seen on many laboratories shelves. SARM'S have been listed with ISO/REMCO, a committee of the International Organization for Standardization, Geneva, dealing with reference materials. Periodically Mintek takes part in the various working groups involved in the development of the guides. Also at these working groups information is shared in the best practices for use and development of reference Materials. An ISO REMCO mirror committee has recently had its inaugural meeting, Mintek is also member. The terms of this technical committee will be published at a later date. The significance of this is that all producers and other role players like accreditation bodies will meet at least once a year to ensure that South African representative has a credible mandate need of South Africa are represented at ISO REMCO.

The greatest care is taken in: 1) the selection, preparation and packing of reference materials to ensure their homogeneity. 2) the analysis of reference materials, by both local and overseas analysts, and 3) the statistical evaluation of results to ensure the best estimate of $A_{true} \approx$ values. ISO guides developed at REMCO are used in the development of the SARM'S. The SARM'S made at mintek are "Reference Materials" as in accordance with ISO guide 30 "Terms and conditions as used in connection with reference materials"

The certificate which is accompanied by each reference material should be consulted to obtain accurate information about certified value, confidence limits and inter laboratory standard deviation. These are available from Mintek or please download from <http://www.mintek.co.za>. Please consult ISO GUIDE 30 to 35 for information on how to use reference materials to statistical test employed in certification Process. They are available from the South African Bureau Standards <http://www.sabs.co.za/>.

QUALITY ASSURANCE

Mintek Executive are committed to ensuring that the management system will at all times comply with ISO 9001:2000, ISO 17025, ISO 14001 and ISO 18001.

ROCKS AND MINERALS

Chemical composition. Mass units indicated in brackets

NUMBER	DESCRIPTION	SiO ₂	Al ₂ O ₃	Fe ₂ O ₃	FeO	MgO	CaO	K ₂ O	MnO	TiO ₂	P ₂ O ₅
SARM 1	Granite	75.7 (%)	12.08 (%)	--	1.3 (%)	--	0.78 (%)	4.99 (%)	--	--	--
SARM 2	Syenite	63.63 (%)	17.34 (%)	1.11 (%)	0.3 (%)	0.46 (%)	0.68 (%)	15.35 (%)	--	--	0.12 (%)
SARM 3	Lujavrite	52.4 (%)	13.64 (%)	8.78 (%)	1.13 (%)	0.28 (%)	3.22 (%)	5.51 (%)	0.77 (%)	0.48 (%)	--
SARM 4	Norite	52.64 (%)	16.5 (%)	--	7.47 (%)	7.5 (%)	11.5 (%)	0.25 (%)	0.18 (%)	0.2 (%)	--
SARM 5	Pyroxenite	51.1 (%)	4.18 (%)	0.87 (%)	10.59 (%)	25.33 (%)	2.66 (%)	0.09 (%)	0.22 (%)	0.2 (%)	--
SARM 6	Dunite	38.96 (%)	--	12.7 (%)	14.63 (%)	43.51 (%)	0.28 (%)	--	0.22 (%)	--	--
SARM 39	Kimberlite	33.44 (%)	4.29 (%)	--	--	26.24 (%)	9.69 (%)	1.04 (%)	0.17 (%)	1.58 (%)	1.46 (%)
SARM 40	Carbonatite	3.08 (%)	0.41 (%)	--	--	1.97 (%)	49.77 (%)	--	0.18 (%)	0.05 (%)	2.05 (%)
SARM 50	Dolerite	51.56 (%)	15.28 (%)	--	8.49 (%)	7.57 (%)	10.8 (%)	0.61 (%)	0.17 (%)	0.86 (%)	0.15 (%)
SARM 41	Carbonaceous shale	56.67 (%)	13.5 (%)	--	--	8.1 (%)	1.5 (%)	1.39 (%)	0.06 (%)	0.55 (%)	0.05 (%)
SARM 42	Soil	74.09 (%)	10.03 (%)	--	--	1.92 (%)	0.89 (%)	0.45 (%)	0.1 (%)	0.36 (%)	--
SARM 43	Magnesite	5.99 (%)	--	--	--	44.11 (%)	0.75 (%)	--	--	--	--
SARM 44	Sillimanite schist	34.84 (%)	58.8 (%)	--	--	--	0.14 (%)	0.18 (%)	0.03 (%)	1.83 (%)	0.1 (%)
SARM 45	Kinzingite	49.62 (%)	26.22 (%)	--	--	3.39 (%)	0.78 (%)	3.18 (%)	0.1 (%)	1.82 (%)	0.08 (%)
SARM 46	Sediment (stream)	35.9 (%)	6.71 (%)	--	--	3.16 (%)	1.32 (%)	0.35 (%)	1.14 (%)	0.6 (%)	0.11 (%)
SARM 47	Serpentinite	36.3 (%)	1.09 (%)	--	--	42.09 (%)	--	--	0.06 (%)	--	--
SARM 48	Fluorspar granite	67.11 (%)	11.24 (%)	--	--	0.18 (%)	8.9 (%)	4.26 (%)	0.02 (%)	0.1 (%)	--
SARM 49	Quartz	99.6 (%)	--	--	--	--	--	--	--	--	--
SARM 50	Dolerite	51.56 (%)	15.28 (%)	--	8.49 (%)	7.57 (%)	10.8 (%)	0.61 (%)	0.17 (%)	0.86 (%)	0.15 (%)
SARM 52	Sediment (stream)	57.81 (%)	9.38 (%)	--	--	0.6 (%)	0.37 (%)	0.25 (%)	0.27 (%)	1.3 (%)	0.09 (%)

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ROCKS AND MINERALS

Chemical composition. Mass units indicated in brackets

NUMBER	DESCRIPTION	Sr	Tb	Th	Ti	U	V	Y	Yb	Zn	Zr
SARM 1	Granite	10 (ppm)	3 (ppm)	51 (ppm)	540 (ppm)	--	--	143 (ppm)	14.2 (ppm)	50 (ppm)	300 (ppm)
SARM 2	Syenite	62 (ppm)	--	1 (ppm)	265 (ppm)	--	10 (ppm)	--	--	--	--
SARM 3	Lujavrite	4600 (ppm)	--	66 (ppm)	2900 (ppm)	14 (ppm)	81 (ppm)	22 (ppm)	--	395 (ppm)	--
SARM 4	Norite	260 (ppm)	--	--	1200 (ppm)	--	220 (ppm)	--	--	68 (ppm)	--
SARM 5	Pyroxenite	32 (ppm)	--	--	1200 (ppm)	--	230 (ppm)	--	--	100 (ppm)	--
SARM 6	Dunite	--	--	--	120 (ppm)	--	40 (ppm)	--	--	90 (ppm)	--
SARM 39	Kimberlite	0.14 (%)	--	--	--	--	109 (ppm)	17 (ppm)	--	70 (ppm)	239 (ppm)
SARM 40	Carbonatite	0.16 (%)	--	--	--	--	27 (ppm)	33 (ppm)	--	25 (ppm)	87 (ppm)
SARM 50	Dolerite	195 (ppm)	--	--	--	--	216 (ppm)	23 (ppm)	--	81 (ppm)	86 (ppm)
SARM 41	Carbonaceous shale	54 (ppm)	--	--	--	--	139 (ppm)	17 (ppm)	--	76 (ppm)	146 (ppm)
SARM 42	Soil	37 (ppm)	--	--	--	--	94 (ppm)	11 (ppm)	--	44 (ppm)	192 (ppm)
SARM 43	Magnesite	8 (ppm)	--	--	--	--	--	--	--	--	--
SARM 44	Sillimanite schist	5 (ppm)	--	50 (ppm)	--	--	395 (ppm)	84 (ppm)	--	271 (ppm)	406 (ppm)
SARM 45	Kinzingite	92 (ppm)	--	--	--	--	266 (ppm)	63 (ppm)	--	74 (ppm)	322 (ppm)
SARM 46	Sediment (stream)	25 (ppm)	--	--	--	--	225 (ppm)	--	--	0.59 (%)	101 (ppm)
SARM 47	Serpentinite	--	--	--	--	--	--	--	--	45 (ppm)	--
SARM 48	Fluorspar granite	29 (ppm)	--	113 (ppm)	--	--	--	436 (ppm)	--	53 (ppm)	300 (ppm)
SARM 49	Quartz	--	--	--	--	--	--	--	--	--	--
SARM 50	Dolerite	195 (ppm)	--	--	--	--	216 (ppm)	23 (ppm)	--	81 (ppm)	86 (ppm)
SARM 52	Sediment (stream)	25 (ppm)	--	--	--	--	346 (ppm)	20 (ppm)	--	264 (ppm)	250 (ppm)

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ROCKS AND MINERALS

Chemical composition. Mass units indicated in brackets

NUMBER	DESCRIPTION	Ba	Ce	Co	Cr	Cu	Eu	F	Ga	La
SARM 1	Granite	--	195 (ppm)	--	12 (ppm)	12 (ppm)	0.35 (ppm)	0.42 (%)	27 (ppm)	109 (ppm)
SARM 2	Syenite	2400 (ppm)	11.9 (ppm)	--	12 (ppm)	19 (ppm)	0.3 (ppm)	--	11 (ppm)	--
SARM 3	Lujavrite	450 (ppm)	--	--	--	13 (ppm)	1.2 (ppm)	0.44 (%)	--	--
SARM 4	Norite	102 (ppm)	--	58 (ppm)	--	14 (ppm)	0.63 (ppm)	--	16 (ppm)	--
SARM 5	Pyroxenite	46 (ppm)	--	110 (ppm)	--	18 (ppm)	--	--	--	--
SARM 6	Dunite	--	--	208 (ppm)	2900 (ppm)	10 (ppm)	--	--	--	--
SARM 39	Kimberlite	0.17 (%)	--	77 (ppm)	--	58 (ppm)	--	--	--	--
SARM 40	Carbonatite	--	--	--	--	--	--	--	--	--
SARM 50	Dolerite	220 (ppm)	--	40 (ppm)	357 (ppm)	84 (ppm)	--	--	--	--
SARM 41	Carbonaceous shale	820 (ppm)	--	--	123 (ppm)	53 (ppm)	--	--	--	--
SARM 42	Soil	--	--	35 (ppm)	--	17 (ppm)	--	--	--	--
SARM 43	Magnesite	--	--	4 (ppm)	--	--	--	--	--	--
SARM 44	Sillimanite schist	--	--	--	384 (ppm)	--	--	--	--	--
SARM 45	Kinzingite	--	--	41 (ppm)	256 (ppm)	11 (ppm)	--	--	--	--
SARM 46	Sediment (stream)	--	--	56 (ppm)	559 (ppm)	566 (ppm)	--	--	--	--
SARM 47	Serpentinite	--	--	79 (ppm)	--	--	--	--	--	--
SARM 48	Fluorspar granite	--	--	--	23 (ppm)	--	--	--	--	--
SARM 49	Quartz	--	--	--	--	--	--	--	--	--
SARM 50	Dolerite	220 (ppm)	--	40 (ppm)	357 (ppm)	84 (ppm)	--	--	--	--
SARM 52	Sediment (stream)	--	--	81 (ppm)	--	219 (ppm)	--	--	--	--

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ROCKS AND MINERALS

Chemical composition. Mass units indicated in brackets

NUMBER	DESCRIPTION	Mn	Nb	Nd	Ni	P	Pb	Rb	Sm
SARM 1	Granite	160 (ppm)	53 (ppm)	72 (ppm)	--	--	40 (ppm)	325 (ppm)	15.8 (ppm)
SARM 2	Syenite	80 (ppm)	--	--	--	520 (ppm)	--	530 (ppm)	--
SARM 3	Lujavrite	6000 (ppm)	960 (ppm)	48 (ppm)	--	260 (ppm)	43 (ppm)	190 (ppm)	--
SARM 4	Norite	1400 (ppm)	--	--	120 (ppm)	--	--	--	--
SARM 5	Pyroxenite	1700 (ppm)	--	--	555 (ppm)	90 (ppm)	--	--	--
SARM 6	Dunite	1700 (ppm)	--	--	2040 (ppm)	--	--	--	--
SARM 39	Kimberlite	--	110 (ppm)	--	994 (ppm)	--	--	52 (ppm)	--
SARM 40	Carbonatite	--	--	--	--	--	--	--	--
SARM 50	Dolerite	--	--	--	--	--	--	14 (ppm)	--
SARM 41	Carbonaceous shale	--	8 (ppm)	--	122 (ppm)	--	--	59 (ppm)	--
SARM 42	Soil	--	--	--	125 (ppm)	--	--	22 (ppm)	--
SARM 43	Magnesite	--	--	--	252 (ppm)	--	--	--	--
SARM 44	Sillimanite schist	--	96 (ppm)	--	--	--	--	13 (ppm)	--
SARM 45	Kinzingite	--	27 (ppm)	--	80 (ppm)	--	--	142 (ppm)	--
SARM 46	Sediment (stream)	--	--	--	--	--	--	--	--
SARM 47	Serpentinite	--	--	--	2221 (ppm)	--	--	--	--
SARM 48	Fluorspar granite	--	202 (ppm)	--	--	--	135 (ppm)	291 (ppm)	--
SARM 49	Quartz	--	--	--	--	--	--	--	--
SARM 50	Dolerite	--	--	--	--	--	--	14 (ppm)	--
SARM 52	Sediment (stream)	--	11 (ppm)	--	182 (ppm)	--	0.12 (%)	20 (ppm)	--

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ROCKS AND MINERALS

Chemical composition. Mass units indicated in brackets

NUMBER	DESCRIPTION	CR2O3	NiO	ZrO2	BaO	SrO	Nb2O5	Cl	F	H2O+	CO2	P2O5
SARM 1	Granite	--	--	--	--	--	--	--	0.42 (%)	0.49 (%)	--	--
SARM 2	Syenite	--	--	--	0.27 (%)	--	--	--	--	0.22 (%)	0.09 (%)	0.12 (%)
SARM 3	Lujavrite	--	--	1.49 (%)	--	0.54 (%)	0.14 (%)	0.12 (%)	0.44 (%)	2.31 (%)	0.17 (%)	--
SARM 4	Norite	--	--	--	--	--	--	--	--	0.33 (%)	--	--
SARM 5	Pyroxenite	3.5 (%)	--	--	--	--	--	--	--	0.26 (%)	--	--
SARM 6	Dunite	0.42 (%)	0.26 (%)	--	--	--	--	--	--	0.3 (%)	0.4 (%)	--
SARM 39	Kimberlite	0.19 (%)	--	--	--	--	--	--	--	--	--	1.46 (%)
SARM 40	Carbonatite	--	--	--	--	--	--	--	--	--	--	2.05 (%)
SARM 50	Dolerite	--	--	--	--	--	--	--	--	--	--	0.15 (%)
SARM 41	Carbonaceous shale	--	--	--	--	--	--	--	--	--	--	0.05 (%)
SARM 42	Soil	0.63 (%)	--	--	--	--	--	--	--	--	--	--
SARM 43	Magnesite	--	--	--	--	--	--	--	--	--	--	--
SARM 44	Sillimanite schist	--	--	--	--	--	--	--	--	--	--	0.1 (%)
SARM 45	Kinzingite	--	--	--	--	--	--	--	--	--	--	0.08 (%)
SARM 46	Sediment (stream)	--	--	--	--	--	--	--	--	--	--	0.11 (%)
SARM 47	Serpentinite	0.29 (%)	--	--	--	--	--	--	--	--	--	--
SARM 48	Fluorspar granite	--	--	--	--	--	--	--	--	--	--	--
SARM 49	Quartz	--	--	--	--	--	--	--	--	--	--	--
SARM 50	Dolerite	--	--	--	--	--	--	--	--	--	--	0.15 (%)
SARM 52	Sediment (stream)	0.19 (%)	--	--	--	--	--	--	--	--	--	0.09 (%)

COAL

Chemical composition. Mass units indicated in brackets

NUMBER	DESCRIPTION	Ga	Ge	Hg	Y	Pb	Ta	Sm	Sr	Th	U	V
SARM 18	Coal (WITBANK)	--	--	--	--	--	--	2 (ppm)	44 (ppm)	3.4 (ppm)	1.5 (ppm)	23 (ppm)
SARM 19	Coal (OFS)	14 (ppm)	13 (ppm)	--	--	20 (ppm)	--	4.9 (ppm)	126 (ppm)	12 (ppm)	5 (ppm)	35 (ppm)
SARM 20	Coal (SASOLBURG)	16 (ppm)	--	0.25 (ppm)	29 (ppm)	26 (ppm)	1.2 (ppm)	6.3 (ppm)	330 (ppm)	18 (ppm)	4 (ppm)	47 (ppm)

NUMBER	DESCRIPTION	SiO ₂	Al ₂ O ₃	Fe ₂ O ₃	TiO ₂	CaO	MgO	K ₂ O	S	LOI	Ba	Be
SARM 18	Coal (WITBANK)	6.2 (%)	2.57 (%)	0.29 (%)	0.114 (%)	0.18 (%)	0.11 (%)	0.145 (%)	0.56 (%)	90.11 (%)	78 (ppm)	4.1 (ppm)
SARM 19	Coal (OFS)	15 (%)	8.01 (%)	1.75 (%)	0.341 (%)	1.39 (%)	0.2 (%)	0.24 (%)	1.49 (%)	71.28 (%)	304 (ppm)	2.8 (ppm)
SARM 20	Coal (SASOLBURG)	17.66 (%)	11.27 (%)	1.17 (%)	0.63 (%)	1.87 (%)	0.43 (%)	0.14 (%)	0.51 (%)	64.66 (%)	372 (ppm)	2.5 (ppm)

NUMBER	DESCRIPTION	Ce	Co	Cr	Cu	Hf	La	Mn	Ni	P	Rb	Sc
SARM 18	Coal (WITBANK)	22 (ppm)	6.7 (ppm)	16 (ppm)	5.9 (ppm)	1.7 (ppm)	10 (ppm)	22 (ppm)	10.8 (ppm)	30 (ppm)	8.1 (ppm)	4.3 (ppm)
SARM 19	Coal (OFS)	56 (ppm)	5.6 (ppm)	50 (ppm)	13 (ppm)	5.4 (ppm)	27 (ppm)	157 (ppm)	16 (ppm)	130 (ppm)	9 (ppm)	7.6 (ppm)
SARM 20	Coal (SASOLBURG)	87 (ppm)	8.3 (ppm)	--	18 (ppm)	4.8 (ppm)	43 (ppm)	80 (ppm)	25 (ppm)	--	10 (ppm)	10 (ppm)

NUMBER	DESCRIPTION	Zn	Zr	Cs
SARM 18	Coal (WITBANK)	5.5 (ppm)	67 (ppm)	--
SARM 19	Coal (OFS)	12 (ppm)	351 (ppm)	1.4 (ppm)
SARM 20	Coal (SASOLBURG)	17 (ppm)	--	--

HEAVY MINERALS

Chemical composition. Mass units indicated in brackets

NUMBER	DESCRIPTION	Al ₂ O ₃	CaO	Cr ₂ O ₃	FeTOT	MgO	MnO	SiO ₂	P ₂ O ₅	TiTOT	V ₂ O ₅
SARM 57	Titanium Slag (RBM)	1.23 (%)	0.16 (%)	0.16 (%)	11.8 (%)	0.98 (%)	1.76 (%)	1.72 (%)	--	85.4 (%)	0.39 (%)
SARM 59	Ilmenite (RBM)	0.61 (%)	0.05 (%)	0.1 (%)	50.3 (%)	0.56 (%)	1.05 (%)	0.75 (%)	--	48.8 (%)	0.25 (%)
SARM 61	Rutile (RBM)	0.93 (%)	--	0.11 (%)	0.68 (%)	--	--	2.03 (%)	--	93.3 (%)	0.42 (%)
SARM 62	Zircon (RBM)	0.88 (%)	--	--	0.07 (%)	--	--	32.8 (%)	0.12 (%)	0.13 (%)	--
SARM 58 stock finished	Titanium Slag (AAC)	2.17 (%)	0.22 (%)	--	9.6 (%)	0.69 (%)	1.44 (%)	2.95 (%)	--	84.1 (%)	0.4 (%)
SARM 60 stock finished	Ilmenite (AAC)	0.63 (%)	0.04 (%)	0.07 (%)	51.7 (%)	0.38 (%)	1.03 (%)	1.21 (%)	--	47.7 (%)	0.27 (%)

METALS

Chemical composition. Mass units indicated in brackets

NUMBER	DESCRIPTION	FeTOT	Mn	S	Co	Ni	Co	Fe	Cr	Ni	V
SARM 33	Ferro-silicon (15% Si)	80.2 (%)	0.75 (%)	--	--	0.28 (%)	--	--	0.43 (%)	0.28 (%)	--
SARM 74	FERRO CHROME METAL	--	--	--	--	0.21 (%)	--	37.5 (%)	49.7 (%)	0.21 (%)	0.36 (%)
SARM 10 replaced by SARM 74	Ferrochromium	--	0.16 (%)	611 (ppm)	512 (ppm)	0.19 (%)	512 (ppm)	36.04 (%)	53.7 (%)	0.19 (%)	0.32 (%)

ORES AND SEMI PROCESSED ORES

Chemical composition. Mass units indicated in brackets

NUMBER	DESCRIPTION	Al ₂ O ₃	Cr ₂ O ₃	Fe ₂ O ₃	FeTOT	MgO	MnO	Mn	P ₂ O ₅	S	SiO ₂	TiO ₂	V ₂ O ₅
SARM 8	Chromium ore	10.57 (%)	48.97 (%)	--	14.13 (%)	14.69 (%)	0.25 (%)	--	--	341 (ppm)	4.3 (%)	0.24 (%)	0.14 (%)
SARM 9	Chromium ore	15.17 (%)	46.45 (%)	--	19.41 (%)	10.85 (%)	0.21 (%)	--	--	28 (ppm)	0.61 (%)	0.56 (%)	0.32 (%)
SARM 11	Hematite ore	--	--	--	--	--	--	--	--	--	--	--	--
SARM 12	Magnetite ore	--	--	--	--	--	--	0.17 (%)	--	695 (ppm)	--	--	--
SARM 13	Zirconium concentrate	0.61 (%)	--	--	--	--	--	--	0.23 (%)	--	32.45 (%)	0.295 (%)	--
SARM 14	Fluorspar Buffalo ac. gr.	--	--	--	--	--	--	--	--	--	--	--	--
SARM 15	Fluorspar Zeerust ac. gr.	--	--	--	--	--	--	213 (ppm)	0.017 (%)	--	--	--	--
SARM 16	Manganese ore (Wessels)	--	--	--	--	0.76 (%)	--	49.17 (%)	--	0.17 (%)	5.04 (%)	--	--
SARM 17	Manganese ore (Mamatwan)	0.24 (%)	--	--	--	3.03 (%)	--	38.81 (%)	--	--	4.69 (%)	--	--
SARM 32	Phosphate rock	--	--	0.14 (%)	--	0.5 (%)	--	--	39.96 (%)	--	--	--	--
SARM 34	Andalusite	59.15 (%)	--	0.75 (%)	--	0.131 (%)	--	--	--	--	39.04 (%)	0.168 (%)	--
SARM 38	V ₂ O ₅	--	--	--	--	37 (ppm)	--	--	--	--	--	--	95.52 (%)
SARM 69	POT SHARD	14,4 (%)	--	7,18 (%)	--	1,85 (%)	0,129 (%)	--	--	--	66,6 (%)	0,777 (%)	--
SARM 77	FERROCHROME SLAG	27.5 (%)	12.5 (%)	--	--	22.99 (%)	--	--	--	--	26.8 (%)	--	--

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ORES AND SEMI PROCESSED ORES

Chemical composition. Mass units indicated in brackets

NUMBER	DESCRIPTION	K ₂ O	Na ₂ O	Co	Ni	Co	Fe	Cr	Ni	V	Na	K	F
SARM 8	Chromium ore	--	--	--	--	--	--	--	--	--	--	--	--
SARM 9	Chromium ore	--	--	--	--	--	--	--	--	--	--	--	--
SARM 11	Hematite ore	--	--	--	--	--	66.16 (%)	--	--	--	--	0.12 (%)	--
SARM 12	Magnetite ore	--	--	223 (ppm)	281 (ppm)	223 (ppm)	66.63 (%)	21 (ppm)	281 (ppm)	520 (ppm)	91 (ppm)	108 (ppm)	--
SARM 13	Zirconium concentrate	--	--	--	--	--	--	--	--	--	--	--	--
SARM 14	Fluorspar Buffalo ac. gr.	--	--	--	--	--	--	--	--	--	--	--	--
SARM 15	Fluorspar Zeerust ac. gr.	--	--	--	--	--	--	--	--	--	--	--	--
SARM 16	Manganese ore (Wessels)	0.02 (%)	--	--	--	--	11.48 (%)	--	--	--	--	--	--
SARM 17	Manganese ore (Mamatwan)	0.09 (%)	0.09 (%)	--	--	--	4.27 (%)	--	--	--	--	--	--
SARM 32	Phosphate rock	--	--	--	--	--	--	--	--	--	--	--	2.49 (%)
SARM 34	Andalusite	0.238 (%)	0.093 (%)	--	--	--	--	--	--	--	--	--	--
SARM 38	V ₂ O ₅	600 (ppm)	--	--	--	--	--	--	--	55.84 (%)	--	--	--
SARM 69	POT SHARD	1,96 (%)	--	28 (ppm)	53 (ppm)	28 (ppm)	--	223 (ppm)	53 (ppm)	--	--	--	--
SARM 77	FERROCHROME SLAG	--	--	--	--	--	5.31 (%)	--	--	--	--	--	--

SARM PROGRAM



PGM AND GOLD ORES

Chemical composition. Mass units indicated in brackets

NUMBER	DESCRIPTION	Pt	Pd	Rh	Ru	Au	Ir	Cu	Ni	Co	S
SARM 53	Gold Head Sample	--	--	--	--	3.99 (ppm)	--	--	--	--	--
SARM 56	Gold Calcine	--	--	--	--	2.69 (ppm)	--	--	--	--	--
SARM 64	PGM ORE UG2 TAIL	0.475 (ppm)	0.210 (ppm)	0.080 (ppm)	0.240 (ppm)	0.018 (ppm)	0.052 (ppm)	--	--	--	--
SARM 70	PGM ORE UG2 LOW	0.4 (ppm)	0.4 (ppm)	0.11 (ppm)	0.15 (ppm)	0.023 (ppm)	0.04 (ppm)	--	--	--	0.033 (%)
SARM 71	PGM ORE UG2 MEDIUM	2.08 (ppm)	1.67 (ppm)	0.43 (ppm)	0.74 (ppm)	0.053 (ppm)	0.17 (ppm)	0.018 (%)	0.124 (%)	0.021 (%)	0.046 (%)
SARM 72	PGM ORE UG2 HIGH	3.97 (ppm)	4.24 (ppm)	0.83 (ppm)	1.18 (ppm)	0.13 (ppm)	--	--	0.17 (%)	--	0.11 (%)
SARM 73	PGM ORE MERENSKY	2.45 (ppm)	1.56 (ppm)	0.26 (ppm)	0.51 (ppm)	0.19 (ppm)	0.11 (ppm)	0.102 (%)	0.215 (%)	0.009 (%)	0.44 (%)
SARM 75	PGM ORE SHEEBA RIDGE	0.32 (ppm)	0.61 (ppm)	--	--	--	--	--	0.23 (%)	--	--
SARM 76	PGM ORE MERENSKY	3.59 (ppm)	1.53 (ppm)	0.256 (ppm)	0.49 (ppm)	--	--	--	0.189 (%)	--	--
SARM 7 replaced by SARM 76	Platinum ore	3.74 (ppm)	1.53 (ppm)	0.24 (ppm)	0.43 (ppm)	0.31 (ppm)	0.074 (ppm)	--	--	--	--
SARM 65 replaced by SARM 72	PGM ORE UG2	2.64 (ppm)	1.28 (ppm)	0.522 (ppm)	0.853 (ppm)	0.034 (ppm)	0.183 (ppm)	--	--	--	--

URANIUM ORES

Chemical composition. Mass units indicated in brackets

NUMBER	DESCRIPTION	U3O8
SARM 21	Uranium-acid leach res.	34.4 (ppm)
SARM 22	Uranium-calcrete	505 (ppm)
SARM 23	Uranium-Pyrite conc.	439 (ppm)
SARM 24	Uranium-slimes dam mat.	100.8 (ppm)
SARM 25	Uranium-Pyrite conc.	775 (ppm)
SARM 26	Uranium-Pyrite conc.	1887 (ppm)
SARM 27	Uranium-acid leach res.	51.2 (ppm)
SARM 28	Uranium-plant calcine	130 (ppm)
SARM 29 stock finished	Uranium-Wits ore	258 (ppm)
SARM 30 stock finished	Uranium-Karoo ore	1241 (ppm)

SARM PROGRAM



PURCHASING PROCEDURE

STANDARD REFERENCE MATERIALS PURCHASE PROCEDURE

WHEN ORDERING STANDARD REFERENCE MATERIALS PLEASE FAX OR E-MAIL A COPY OF AN ORDER WITH THE FOLLOWING:

- ORDER WITH THE ORDER NUMBER
- MATERIAL NAME, QUANTITY(unit size or weight)
- DELIVERY (PHYSICAL/SREET) ADDRESS
- CONTACT PERSON
- TELEPHONE AND FAX NUMBER
- VAT REGISTRATION NUMBER (this applies for companies within borders of South Africa)
- HAS TO BE IN ZAR(rand) OR USD UNITS

PRICE LIST (Excluding delivery, packaging, documentation and insurance) QUOTES, PRO-FORMA INVOICES FOR THESE MATERIALS CAN BE PROVIDED ON REQUEST PRIOR TO THE OFFICIAL ORDER.

CUSTOMS CHARGES WILL ALWAYS BE THE RESPONSIBILITY OF THE BUYER / PURCHASER / AGENT

AN INVOICE WILL BE MADE UPON THE RECEIPT OF THE OFFICIAL ORDER

Payments

Either through direct transfer or via Credit / Visa / Master Card / American Express

Cheque or money order addressed to Mintek and must be non-transfereable.

DELIVERY TIME : 10 Days from the receipt of an official order & proof of payment

PAYMENTS CAN BE MADE TO:

MINTEK

ABSA BANK

STRIJDOM PARK BRANCH

P O Box 997

NORTHRIDING, 2162

ACCOUNT NUMBER :01-00004-150-1

ACCOUNT HOLDER :MINTEK

BRANCH CODE : 51-50-05-90

SWIFT CODE :ABSA ZAJJ

SARM PROGRAM



INDEX AND CERTIFICATION DATE

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ROCKS AND MINERALS	SARM 1	Granite	09/74	4
	SARM 2	Syenite	09/74	4
	SARM 3	Lujavrite	09/74	4
	SARM 4	Norite	09/74	4
	SARM 5	Pyroxenite	09/74	4
	SARM 6	Dunite	09/74	4
	SARM 39	Kimberlite	06/89	4
	SARM 40	Carbonatite	06/89	4
	SARM 50	Dolerite	06/89	4
	SARM 41	Carbonaceous shale	06/89	4
	SARM 42	Soil	06/89	4
	SARM 43	Magnesite	06/89	4
	SARM 44	Sillimanite schist	06/89	4
	SARM 45	Kinzingite	06/89	4
	SARM 46	Sediment (stream)	06/89	4
	SARM 47	Serpentinite	06/89	4
	SARM 48	Fluorspar granite	06/89	4
	SARM 49	Quartz	06/89	4
	SARM 50	Dolerite	06/89	4
	SARM 52	Sediment (stream)	06/89	4
HEAVY MINERALS	SARM 57	Titanium Slag (RBM)	01/96	10
	SARM 59	Ilmenite (RBM)	01/96	10
	SARM 61	Rutile (RBM)	01/96	10
	SARM 62	Zircon (RBM)	01/96	10
	SARM 58 finished SARM 60 finished	Titanium Slag (AAC) Ilmenite (AAC)	01/96 01/96	10 10
METALS	SARM 33	Ferro-silicon (15% Si)	01/86	10
	SARM 74	FERRO CHROME METAL	07/06	10
	SARM 10 <> SARM 74	Ferrocromium	06/78	10

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	SARM 9	Chromium ore	06/78	11	
	SARM 11	Hematite ore	10/78	11	
	SARM 12	Magnetite ore	12/78	11	
	SARM 13	Zirconium concentrate	07/81	11	
	SARM 14	Fluorspar Buffalo ac. gr.	08/81	11	
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	SARM 17	Manganese ore (Mamatwan)	08/82	11	
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		SARM 23	Uranium-Pyrite conc.	08/81	14
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