OXIDE	WT %	MOL WT	ATOMS	
WO3	0.07	231.80	0.002	W
Ta2O5	72.90	220.90	1.754	Ta
Nb2O5	5.79	132.90	0.232	Nb
TiO2	0.19	79.90	0.013	Ti
ZrO2	0.00	123.20	0.000	Zr
SnO2	0.00	150.70	0.000	Sn
Fe2O3	0.00	159.70	0.000	Fe+3
ThO2	0.00	264.00	0.000	Th
UO2	0.00	270.00	0.000	U+4
UO3	1.92	286.00	0.036	U+6
U3O8	0.00	842.00	0.000	U+8
Y2O3	0.00	112.90	0.000	Y
La2O3	0.00	162.90	0.000	La
Ce2O3	0.00	164.10	0.000	Ce
Pr2O3	0.00	164.90	0.000	Pr
Nd2O3	0.00	168.20	0.000	Nd
Sm2O3	0.00	174.40	0.000	Sm
Sb2O3	0.17	145.70	0.006	Sb+3
Bi2O3	0.00	233.00	0.000	Bi+3
MnO	0.08	70.94	0.006	Mn+2
FeO	0.00	71.85	0.000	Fe+2
CaO	11.50	56.08	1.090	Ca
SrO	0.00	103.60	0.000	Sr
BaO	0.00	153.30	0.000	Ba
PbO	0.17	223.20	0.004	Pb+2
Na2O	4.82	30.99	0.827	Na
K2O	0.00	47.10	0.000	K
Cs2O	0.00	140.90	0.000	Cs
F	2.26	19.00	0.632	F
H2O+	0.00	9.01	0.000	OH
H2O-	0.00	18.02	0.000	H2O
TOTAL	99.87		6.308	O
LESS O=F	0.95			
TOTAL	98.92			

A	B	O	(O	OH	F	) . 0.00 H2O
1.97	2.0	6.00	0.31	0.00	0.63	

(O + OH + F) = 0.94 Vacancies: 0.03 A 0.06 Y
Dose (alphas/mg) = 0.776E+17 DPA (displacements/atom) = 9.6

microlite Age = 0.130E+10 years

Cation abundances (decreasing order):

A = Ca ,Na ,U+6 ,Sb+3,Mn+2,Pb+2,K ,Ce ,Pr ,Nd ,Sm ,U+8
Mean A valence = 1.66

B = Ta ,Nb ,Ti ,W ,Sn ,Zr ,Fe+3
Mean B valence = 4.99

OXIDE	WT %	MOL WT	ATOMS	
WO3	0.11	231.80	0.003	W
Ta2O5	71.20	220.90	1.741	Ta
Nb2O5	5.01	132.90	0.204	Nb
TiO2	0.78	79.90	0.053	Ti
ZrO2	0.00	123.20	0.000	Zr
SnO2	0.00	150.70	0.000	Sn
Fe2O3	0.00	159.70	0.000	Fe+3
ThO2	0.00	264.00	0.000	Th
UO2	0.00	270.00	0.000	U+4
UO3	3.04	286.00	0.057	U+6
U3O8	0.00	842.00	0.000	U+8
Y2O3	0.00	112.90	0.000	Y
La2O3	0.00	162.90	0.000	La
Ce2O3	0.00	164.10	0.000	Ce
Pr2O3	0.00	164.90	0.000	Pr
Nd2O3	0.00	168.20	0.000	Nd
Sm2O3	0.00	174.40	0.000	Sm
Sb2O3	0.24	145.70	0.009	Sb+3
Bi2O3	0.00	233.00	0.000	Bi+3
MnO	0.21	70.94	0.016	Mn+2
FeO	0.26	71.85	0.020	Fe+2
CaO	12.20	56.08	1.175	Ca
SrO	0.00	103.60	0.000	Sr
BaO	0.00	153.30	0.000	Ba
PbO	0.54	223.20	0.013	Pb+2
Na2O	3.65	30.99	0.636	Na
K2O	0.00	47.10	0.000	K
Cs2O	0.00	140.90	0.000	Cs
F	1.94	19.00	0.552	F
H2O+	0.00	9.01	0.000	OH
H2O-	0.00	18.02	0.000	H2O
TOTAL	99.18		6.427	O
LESS O=F	0.81			
TOTAL	98.37			

A	B	O	(O	OH	F	) . 0.00 H2O
1.93	2.0	6.00	0.43	0.00	0.55	

(O + OH + F) = 0.98 Vacancies: 0.07 A 0.02 Y
Dose (alphas/mg) = 0.124E+18 DPA (displacements/atom) = 15.6

microlite Age = 0.130E+10 years

Cation abundances (decreasing order):

A = Ca ,Na ,U+6 ,Fe+2,Mn+2,Pb+2,Sb+3,K ,Pr ,Nd ,Sm ,Ce
Mean A valence = 1.79

B = Ta ,Nb ,Ti ,W ,Sn ,Zr ,Fe+3
Mean B valence = 4.97

OXIDE	WT %	MOL WT	ATOMS	
WO3	0.13	231.80	0.003	W
Ta2O5	71.70	220.90	1.758	Ta
Nb2O5	3.88	132.90	0.158	Nb
TiO2	1.19	79.90	0.081	Ti
ZrO2	0.00	123.20	0.000	Zr
SnO2	0.00	150.70	0.000	Sn
Fe2O3	0.00	159.70	0.000	Fe+3
ThO2	0.00	264.00	0.000	Th
UO2	0.00	270.00	0.000	U+4
UO3	3.24	286.00	0.061	U+6
U3O8	0.00	842.00	0.000	U+8
Y2O3	0.00	112.90	0.000	Y
La2O3	0.00	162.90	0.000	La
Ce2O3	0.00	164.10	0.000	Ce
Pr2O3	0.00	164.90	0.000	Pr
Nd2O3	0.00	168.20	0.000	Nd
Sm2O3	0.00	174.40	0.000	Sm
Sb2O3	0.23	145.70	0.009	Sb+3
Bi2O3	0.00	233.00	0.000	Bi+3
MnO	0.36	70.94	0.027	Mn+2
FeO	0.14	71.85	0.011	Fe+2
CaO	13.20	56.08	1.275	Ca
SrO	0.00	103.60	0.000	Sr
BaO	0.00	153.30	0.000	Ba
PbO	0.40	223.20	0.010	Pb+2
Na2O	2.86	30.99	0.500	Na
K2O	0.00	47.10	0.000	K
Cs2O	0.00	140.90	0.000	Cs
F	1.55	19.00	0.442	F
H2O+	0.00	9.01	0.000	OH
H2O-	0.00	18.02	0.000	H2O
TOTAL	98.88		6.510	O
LESS O=F	0.65			
TOTAL	98.23			

A	B	O	(O	OH	F	) . 0.00 H2O
1.89	2.0	6.00	0.51	0.00	0.44	

(O + OH + F) = 0.95 Vacancies: 0.11 A 0.05 Y
Dose (alphas/mg) = 0.132E+18 DPA (displacements/atom) = 17.0

microlite Age = 0.130E+10 years

Cation abundances (decreasing order):

A = Ca ,Na ,U+6 ,Mn+2,Fe+2,Pb+2,Sb+3,K ,Pr ,Nd ,Sm ,Ce
Mean A valence = 1.87

B = Ta ,Nb ,Ti ,W ,Sn ,Zr ,Fe+3
Mean B valence = 4.96

OXIDE	WT %	MOL WT	ATOMS	
WO3	0.07	231.80	0.002	W
Ta2O5	70.50	220.90	1.713	Ta
Nb2O5	4.83	132.90	0.195	Nb
TiO2	1.34	79.90	0.090	Ti
ZrO2	0.00	123.20	0.000	Zr
SnO2	0.00	150.70	0.000	Sn
Fe2O3	0.00	159.70	0.000	Fe+3
ThO2	0.00	264.00	0.000	Th
UO2	0.00	270.00	0.000	U+4
UO3	3.74	286.00	0.070	U+6
U3O8	0.00	842.00	0.000	U+8
Y2O3	0.00	112.90	0.000	Y
La2O3	0.00	162.90	0.000	La
Ce2O3	0.00	164.10	0.000	Ce
Pr2O3	0.00	164.90	0.000	Pr
Nd2O3	0.00	168.20	0.000	Nd
Sm2O3	0.00	174.40	0.000	Sm
Sb2O3	0.38	145.70	0.014	Sb+3
Bi2O3	0.00	233.00	0.000	Bi+3
MnO	0.62	70.94	0.047	Mn+2
FeO	0.37	71.85	0.028	Fe+2
CaO	12.10	56.08	1.158	Ca
SrO	0.00	103.60	0.000	Sr
BaO	0.00	153.30	0.000	Ba
PbO	0.17	223.20	0.004	Pb+2
Na2O	3.49	30.99	0.605	Na
K2O	0.00	47.10	0.000	K
Cs2O	0.00	140.90	0.000	Cs
F	1.85	19.00	0.523	F
H2O+	0.00	9.01	0.000	OH
H2O-	0.00	18.02	0.000	H2O
TOTAL	99.46		6.465	O
LESS O=F	0.78			
TOTAL	98.68			

A	B	O	(O	OH	F	) . 0.00 H2O
1.93	2.0	6.00	0.47	0.00	0.52	

(O + OH + F) = 0.99 Vacancies: 0.07 A 0.01 Y
Dose (alphas/mg) = 0.152E+18 DPA (displacements/atom) = 19.2

microlite Age = 0.130E+10 years

Cation abundances (decreasing order):

A = Ca ,Na ,U+6 ,Mn+2,Fe+2,Sb+3,Pb+2,K ,Pr ,Nd ,Sm ,La
Mean A valence = 1.84

B = Ta ,Nb ,Ti ,W ,Sn ,Zr ,Fe+3
Mean B valence = 4.96

OXIDE	WT %	MOL WT	ATOMS	
WO3	0.07	231.80	0.002	W
Ta2O5	71.40	220.90	1.716	Ta
Nb2O5	5.27	132.90	0.211	Nb
TiO2	1.08	79.90	0.072	Ti
ZrO2	0.00	123.20	0.000	Zr
SnO2	0.00	150.70	0.000	Sn
Fe2O3	0.00	159.70	0.000	Fe+3
ThO2	0.00	264.00	0.000	Th
UO2	0.00	270.00	0.000	U+4
UO3	3.27	286.00	0.061	U+6
U3O8	0.00	842.00	0.000	U+8
Y2O3	0.00	112.90	0.000	Y
La2O3	0.00	162.90	0.000	La
Ce2O3	0.00	164.10	0.000	Ce
Pr2O3	0.00	164.90	0.000	Pr
Nd2O3	0.00	168.20	0.000	Nd
Sm2O3	0.00	174.40	0.000	Sm
Sb2O3	0.50	145.70	0.018	Sb+3
Bi2O3	0.00	233.00	0.000	Bi+3
MnO	0.47	70.94	0.035	Mn+2
FeO	0.34	71.85	0.025	Fe+2
CaO	11.60	56.08	1.098	Ca
SrO	0.00	103.60	0.000	Sr
BaO	0.00	153.30	0.000	Ba
PbO	0.42	223.20	0.010	Pb+2
Na2O	3.23	30.99	0.553	Na
K2O	0.00	47.10	0.000	K
Cs2O	0.00	140.90	0.000	Cs
F	1.53	19.00	0.428	F
H2O+	0.00	9.01	0.000	OH
H2O-	0.00	18.02	0.000	H2O
TOTAL	99.18		6.406	O
LESS O=F	0.64			
TOTAL	98.54			

A	B	O	(O	OH	F	) . 0.00 H2O
1.80	2.0	6.00	0.41	0.00	0.43	

(O + OH + F) = 0.83 Vacancies: 0.20 A 0.17 Y

Dose (alphas/mg) = 0.133E+18 DPA (displacements/atom) = 17.0

microlite Age = 0.130E+10 years

Cation abundances (decreasing order):

A = Ca ,Na ,U+6 ,Mn+2,Fe+2,Sb+3,Pb+2,K ,Pr ,Nd ,Sm ,La

Mean A valence = 1.84

B = Ta ,Nb ,Ti ,W ,Sn ,Zr ,Fe+3

Mean B valence = 4.96

OXIDE	WT %	MOL WT	ATOMS	
WO3	0.00	231.80	0.000	W
Ta2O5	72.30	220.90	1.748	Ta
Nb2O5	5.43	132.90	0.218	Nb
TiO2	0.51	79.90	0.034	Ti
ZrO2	0.00	123.20	0.000	Zr
SnO2	0.00	150.70	0.000	Sn
Fe2O3	0.00	159.70	0.000	Fe+3
ThO2	0.00	264.00	0.000	Th
UO2	0.00	270.00	0.000	U+4
UO3	2.45	286.00	0.046	U+6
U3O8	0.00	842.00	0.000	U+8
Y2O3	0.00	112.90	0.000	Y
La2O3	0.00	162.90	0.000	La
Ce2O3	0.00	164.10	0.000	Ce
Pr2O3	0.00	164.90	0.000	Pr
Nd2O3	0.00	168.20	0.000	Nd
Sm2O3	0.00	174.40	0.000	Sm
Sb2O3	0.27	145.70	0.010	Sb+3
Bi2O3	0.00	233.00	0.000	Bi+3
MnO	0.88	70.94	0.066	Mn+2
FeO	0.42	71.85	0.031	Fe+2
CaO	13.90	56.08	1.324	Ca
SrO	0.00	103.60	0.000	Sr
BaO	0.00	153.30	0.000	Ba
PbO	0.23	223.20	0.006	Pb+2
Na2O	2.41	30.99	0.415	Na
K2O	0.00	47.10	0.000	K
Cs2O	0.00	140.90	0.000	Cs
F	1.53	19.00	0.430	F
H2O+	0.00	9.01	0.000	OH
H2O-	0.00	18.02	0.000	H2O
TOTAL	100.33		6.554	O
LESS O=F	0.64			
TOTAL	99.68			

A	B	O	(O	OH	F	) . 0.00 H2O
1.90	2.0	6.00	0.55	0.00	0.43	

(O + OH + F) = 0.98 Vacancies: 0.10 A 0.02 Y
Dose (alphas/mg) = 0.983E+17 DPA (displacements/atom) = 12.6

microlite Age = 0.130E+10 years

Cation abundances (decreasing order):

A = Ca ,Na ,Mn+2,U+6 ,Fe+2,Sb+3,Pb+2,K ,Pr ,Nd ,Sm ,La
Mean A valence = 1.88

B = Ta ,Nb ,Ti ,Sn ,W ,Zr ,Fe+3
Mean B valence = 4.98

OXIDE	WT %	MOL WT	ATOMS	
WO3	0.37	231.80	0.008	W
Ta2O5	63.90	220.90	1.535	Ta
Nb2O5	8.52	132.90	0.340	Nb
TiO2	1.76	79.90	0.117	Ti
ZrO2	0.00	123.20	0.000	Zr
SnO2	0.00	150.70	0.000	Sn
Fe2O3	0.00	159.70	0.000	Fe+3
ThO2	0.00	264.00	0.000	Th
UO2	0.00	270.00	0.000	U+4
UO3	8.62	286.00	0.160	U+6
U3O8	0.00	842.00	0.000	U+8
Y2O3	0.00	112.90	0.000	Y
La2O3	0.00	162.90	0.000	La
Ce2O3	0.00	164.10	0.000	Ce
Pr2O3	0.00	164.90	0.000	Pr
Nd2O3	0.00	168.20	0.000	Nd
Sm2O3	0.00	174.40	0.000	Sm
Sb2O3	0.28	145.70	0.010	Sb+3
Bi2O3	0.00	233.00	0.000	Bi+3
MnO	1.44	70.94	0.108	Mn+2
FeO	0.04	71.85	0.003	Fe+2
CaO	9.45	56.08	0.894	Ca
SrO	0.00	103.60	0.000	Sr
BaO	0.00	153.30	0.000	Ba
PbO	1.28	223.20	0.030	Pb+2
Na2O	2.69	30.99	0.460	Na
K2O	0.00	47.10	0.000	K
Cs2O	0.00	140.90	0.000	Cs
F	1.38	19.00	0.385	F
H2O+	0.00	9.01	0.000	OH
H2O-	0.00	18.02	0.000	H2O
TOTAL	99.73		6.514	O
LESS O=F	0.58			
TOTAL	99.15			

A	B	O	(O	OH	F	) . 0.00 H2O
1.67	2.0	6.00	0.51	0.00	0.39	

(O + OH + F) = 0.90 Vacancies: 0.33 A 0.10 Y

Dose (alphas/mg) = 0.348E+18 DPA (displacements/atom) = 45.4

microlite Age = 0.130E+10 years

Cation abundances (decreasing order):

A = Ca ,Na ,U+6 ,Mn+2,Pb+2,Sb+3,Fe+2,K ,Pr ,Nd ,Sm ,La
Mean A valence = 2.11

B = Ta ,Nb ,Ti ,W ,Sn ,Zr ,Fe+3
Mean B valence = 4.95

OXIDE	WT %	MOL WT	ATOMS	
WO3	0.24	231.80	0.006	W
Ta2O5	65.20	220.90	1.668	Ta
Nb2O5	7.51	132.90	0.319	Nb
TiO2	0.10	79.90	0.007	Ti
ZrO2	0.00	123.20	0.000	Zr
SnO2	0.00	150.70	0.000	Sn
Fe2O3	0.00	159.70	0.000	Fe+3
ThO2	0.00	264.00	0.000	Th
UO2	0.00	270.00	0.000	U+4
UO3	7.67	286.00	0.152	U+6
U3O8	0.00	842.00	0.000	U+8
Y2O3	0.00	112.90	0.000	Y
La2O3	0.00	162.90	0.000	La
Ce2O3	0.00	164.10	0.000	Ce
Pr2O3	0.00	164.90	0.000	Pr
Nd2O3	0.00	168.20	0.000	Nd
Sm2O3	0.00	174.40	0.000	Sm
Sb2O3	0.17	145.70	0.007	Sb+3
Bi2O3	0.00	233.00	0.000	Bi+3
MnO	1.04	70.94	0.083	Mn+2
FeO	0.08	71.85	0.006	Fe+2
CaO	9.19	56.08	0.926	Ca
SrO	0.00	103.60	0.000	Sr
BaO	0.00	153.30	0.000	Ba
PbO	3.48	223.20	0.088	Pb+2
Na2O	1.85	30.99	0.337	Na
K2O	0.00	47.10	0.000	K
Cs2O	0.00	140.90	0.000	Cs
F	0.17	19.00	0.051	F
H2O+	0.00	9.01	0.000	OH
H2O-	0.00	18.02	0.000	H2O
TOTAL	96.70		6.710	O
LESS O=F	0.07			
TOTAL	96.63			

A	B	O	(O	OH	F	) . 0.00 H2O
1.60	2.0	6.00	0.71	0.00	0.05	

(O + OH + F) = 0.76 Vacancies: 0.40 A 0.24 Y
Dose (alphas/mg) = 0.318E+18 DPA (displacements/atom) = 44.8

microlite Age = 0.130E+10 years

Cation abundances (decreasing order):

A = Ca ,Na ,U+6 ,Pb+2,Mn+2,Sb+3,Fe+2,K ,Pr ,Nd ,Sm ,La
Mean A valence = 2.17

B = Ta ,Nb ,Ti ,W ,Sn ,Zr ,Fe+3
Mean B valence = 5.00

OXIDE	WT %	MOL WT	ATOMS	
WO3	0.53	231.80	0.013	W
Ta2O5	64.10	220.90	1.652	Ta
Nb2O5	7.67	132.90	0.329	Nb
TiO2	0.09	79.90	0.006	Ti
ZrO2	0.00	123.20	0.000	Zr
SnO2	0.00	150.70	0.000	Sn
Fe2O3	0.00	159.70	0.000	Fe+3
ThO2	0.00	264.00	0.000	Th
UO2	0.00	270.00	0.000	U+4
UO3	7.50	286.00	0.149	U+6
U3O8	0.00	842.00	0.000	U+8
Y2O3	0.00	112.90	0.000	Y
La2O3	0.00	162.90	0.000	La
Ce2O3	0.00	164.10	0.000	Ce
Pr2O3	0.00	164.90	0.000	Pr
Nd2O3	0.00	168.20	0.000	Nd
Sm2O3	0.00	174.40	0.000	Sm
Sb2O3	0.17	145.70	0.007	Sb+3
Bi2O3	0.00	233.00	0.000	Bi+3
MnO	1.13	70.94	0.091	Mn+2
FeO	0.05	71.85	0.004	Fe+2
CaO	8.52	56.08	0.865	Ca
SrO	0.00	103.60	0.000	Sr
BaO	0.00	153.30	0.000	Ba
PbO	4.27	223.20	0.109	Pb+2
Na2O	2.16	30.99	0.397	Na
K2O	0.00	47.10	0.000	K
Cs2O	0.00	140.90	0.000	Cs
F	0.20	19.00	0.060	F
H2O+	0.00	9.01	0.000	OH
H2O-	0.00	18.02	0.000	H2O
TOTAL	96.39		6.698	O
LESS O=F	0.08			
TOTAL	96.31			

A	B	O	(O	OH	F	) . 0.00 H2O
1.62	2.0	6.00	0.70	0.00	0.06	

(O + OH + F) = 0.76 Vacancies: 0.38 A 0.24 Y
Dose (alphas/mg) = 0.312E+18 DPA (displacements/atom) = 44.0

microlite Age = 0.130E+10 years

Cation abundances (decreasing order):

A = Ca ,Na ,U+6 ,Pb+2,Mn+2,Sb+3,Fe+2,K ,Pr ,Nd ,Sm ,La
Mean A valence = 2.13

B = Ta ,Nb ,W ,Ti ,Sn ,Zr ,Fe+3
Mean B valence = 5.00

OXIDE	WT %	MOL WT	ATOMS	
WO3	0.37	231.80	0.009	W
Ta2O5	62.10	220.90	1.558	Ta
Nb2O5	10.20	132.90	0.425	Nb
TiO2	0.11	79.90	0.008	Ti
ZrO2	0.00	123.20	0.000	Zr
SnO2	0.00	150.70	0.000	Sn
Fe2O3	0.00	159.70	0.000	Fe+3
ThO2	0.00	264.00	0.000	Th
UO2	0.00	270.00	0.000	U+4
UO3	8.06	286.00	0.156	U+6
U3O8	0.00	842.00	0.000	U+8
Y2O3	0.00	112.90	0.000	Y
La2O3	0.00	162.90	0.000	La
Ce2O3	0.00	164.10	0.000	Ce
Pr2O3	0.00	164.90	0.000	Pr
Nd2O3	0.00	168.20	0.000	Nd
Sm2O3	0.00	174.40	0.000	Sm
Sb2O3	0.12	145.70	0.005	Sb+3
Bi2O3	0.00	233.00	0.000	Bi+3
MnO	1.20	70.94	0.094	Mn+2
FeO	0.07	71.85	0.005	Fe+2
CaO	10.90	56.08	1.077	Ca
SrO	0.00	103.60	0.000	Sr
BaO	0.00	153.30	0.000	Ba
PbO	1.39	223.20	0.035	Pb+2
Na2O	3.50	30.99	0.626	Na
K2O	0.00	47.10	0.000	K
Cs2O	0.00	140.90	0.000	Cs
F	1.35	19.00	0.394	F
H2O+	0.00	9.01	0.000	OH
H2O-	0.00	18.02	0.000	H2O
TOTAL	99.37		6.803	O
LESS O=F	0.57			
TOTAL	98.80			

A	B	O	(O	OH	F	) . 0.00 H2O
2.00	2.0	6.00	0.80	0.00	0.39	

(O + OH + F) = 1.20 Vacancies: 0.00 A -.20 Y
Dose (alphas/mg) = 0.327E+18 DPA (displacements/atom) = 42.9

microlite Age = 0.130E+10 years

Cation abundances (decreasing order):

A = Ca ,Na ,U+6 ,Mn+2,Pb+2,Fe+2,Sb+3,K ,Pr ,Nd ,Sm ,Ce
Mean A valence = 2.00

B = Ta ,Nb ,W ,Ti ,Sn ,Zr ,Fe+3
Mean B valence = 5.00

OXIDE	WT %	MOL WT	ATOMS	
WO3	0.38	231.80	0.009	W
Ta2O5	61.70	220.90	1.560	Ta
Nb2O5	10.10	132.90	0.424	Nb
TiO2	0.09	79.90	0.006	Ti
ZrO2	0.00	123.20	0.000	Zr
SnO2	0.00	150.70	0.000	Sn
Fe2O3	0.00	159.70	0.000	Fe+3
ThO2	0.00	264.00	0.000	Th
UO2	0.00	270.00	0.000	U+4
UO3	8.06	286.00	0.157	U+6
U3O8	0.00	842.00	0.000	U+8
Y2O3	0.00	112.90	0.000	Y
La2O3	0.00	162.90	0.000	La
Ce2O3	0.00	164.10	0.000	Ce
Pr2O3	0.00	164.90	0.000	Pr
Nd2O3	0.00	168.20	0.000	Nd
Sm2O3	0.00	174.40	0.000	Sm
Sb2O3	0.20	145.70	0.008	Sb+3
Bi2O3	0.00	233.00	0.000	Bi+3
MnO	1.05	70.94	0.083	Mn+2
FeO	0.03	71.85	0.002	Fe+2
CaO	10.60	56.08	1.056	Ca
SrO	0.00	103.60	0.000	Sr
BaO	0.00	153.30	0.000	Ba
PbO	1.30	223.20	0.033	Pb+2
Na2O	3.69	30.99	0.665	Na
K2O	0.00	47.10	0.000	K
Cs2O	0.00	140.90	0.000	Cs
F	1.19	19.00	0.350	F
H2O+	0.00	9.01	0.000	OH
H2O-	0.00	18.02	0.000	H2O
TOTAL	98.39		6.816	O
LESS O=F	0.50			
TOTAL	97.89			

A	B	O	(O	OH	F	) . 0.00 H2O
2.00	2.0	6.00	0.82	0.00	0.35	

(O + OH + F) = 1.17 Vacancies: 0.00 A -.17 Y
Dose (alphas/mg) = 0.330E+18 DPA (displacements/atom) = 43.4

microlite Age = 0.130E+10 years

Cation abundances (decreasing order):

A = Ca ,Na ,U+6 ,Mn+2,Pb+2,Sb+3,Fe+2,K ,Pr ,Nd ,Sm ,La
Mean A valence = 1.99

B = Ta ,Nb ,W ,Ti ,Sn ,Zr ,Fe+3
Mean B valence = 5.00

OXIDE	WT %	MOL WT	ATOMS	
WO3	0.41	231.80	0.010	W
Ta2O5	65.30	220.90	1.669	Ta
Nb2O5	7.44	132.90	0.316	Nb
TiO2	0.07	79.90	0.005	Ti
ZrO2	0.00	123.20	0.000	Zr
SnO2	0.00	150.70	0.000	Sn
Fe2O3	0.00	159.70	0.000	Fe+3
ThO2	0.00	264.00	0.000	Th
UO2	0.00	270.00	0.000	U+4
UO3	7.52	286.00	0.148	U+6
U3O8	0.00	842.00	0.000	U+8
Y2O3	0.00	112.90	0.000	Y
La2O3	0.00	162.90	0.000	La
Ce2O3	0.00	164.10	0.000	Ce
Pr2O3	0.00	164.90	0.000	Pr
Nd2O3	0.00	168.20	0.000	Nd
Sm2O3	0.00	174.40	0.000	Sm
Sb2O3	0.19	145.70	0.007	Sb+3
Bi2O3	0.00	233.00	0.000	Bi+3
MnO	1.11	70.94	0.088	Mn+2
FeO	0.09	71.85	0.007	Fe+2
CaO	10.80	56.08	1.087	Ca
SrO	0.00	103.60	0.000	Sr
BaO	0.00	153.30	0.000	Ba
PbO	0.88	223.20	0.022	Pb+2
Na2O	3.43	30.99	0.625	Na
K2O	0.00	47.10	0.000	K
Cs2O	0.00	140.90	0.000	Cs
F	1.32	19.00	0.392	F
H2O+	0.00	9.01	0.000	OH
H2O-	0.00	18.02	0.000	H2O
TOTAL	98.56		6.780	O
LESS O=F	0.55			
TOTAL	98.01			

A	B	O	(O	OH	F	) . 0.00 H2O
1.99	2.0	6.00	0.78	0.00	0.39	

(O + OH + F) = 1.17 Vacancies: 0.01 A -.17 Y
Dose (alphas/mg) = 0.307E+18 DPA (displacements/atom) = 40.8

microlite Age = 0.130E+10 years

Cation abundances (decreasing order):

A = Ca ,Na ,U+6 ,Mn+2,Pb+2,Sb+3,Fe+2,K ,Pr ,Nd ,Sm ,La
Mean A valence = 1.99

B = Ta ,Nb ,W ,Ti ,Sn ,Zr ,Fe+3
Mean B valence = 5.00

OXIDE	WT %	MOL WT	ATOMS	
WO3	0.09	231.80	0.002	W
Ta2O5	59.60	220.90	1.503	Ta
Nb2O5	8.36	132.90	0.350	Nb
TiO2	2.07	79.90	0.144	Ti
ZrO2	0.00	123.20	0.000	Zr
SnO2	0.00	150.70	0.000	Sn
Fe2O3	0.00	159.70	0.000	Fe+3
ThO2	0.00	264.00	0.000	Th
UO2	0.00	270.00	0.000	U+4
UO3	9.26	286.00	0.180	U+6
U3O8	0.00	842.00	0.000	U+8
Y2O3	0.00	112.90	0.000	Y
La2O3	0.00	162.90	0.000	La
Ce2O3	0.00	164.10	0.000	Ce
Pr2O3	0.00	164.90	0.000	Pr
Nd2O3	0.00	168.20	0.000	Nd
Sm2O3	0.00	174.40	0.000	Sm
Sb2O3	0.25	145.70	0.010	Sb+3
Bi2O3	0.00	233.00	0.000	Bi+3
MnO	1.44	70.94	0.113	Mn+2
FeO	0.00	71.85	0.000	Fe+2
CaO	13.10	56.08	1.301	Ca
SrO	0.00	103.60	0.000	Sr
BaO	0.00	153.30	0.000	Ba
PbO	1.51	223.20	0.038	Pb+2
Na2O	2.54	30.99	0.457	Na
K2O	0.00	47.10	0.000	K
Cs2O	0.00	140.90	0.000	Cs
F	1.55	19.00	0.454	F
H2O+	0.00	9.01	0.000	OH
H2O-	0.00	18.02	0.000	H2O
TOTAL	99.77		6.937	O
LESS O=F	0.65			
TOTAL	99.12			

A	B	O	(O	OH	F	) . 0.00 H2O
2.10	2.0	6.00	0.94	0.00	0.45	

(O + OH + F) = 1.39 Vacancies: -.10 A -.39 Y
Dose (alphas/mg) = 0.374E+18 DPA (displacements/atom) = 48.8

microlite Age = 0.130E+10 years

Cation abundances (decreasing order):

A = Ca ,Na ,U+6 ,Mn+2,Pb+2,Sb+3,K ,Ce ,Pr ,Nd ,Sm ,La
Mean A valence = 2.13

B = Ta ,Nb ,Ti ,W ,Sn ,Zr ,Fe+3
Mean B valence = 4.93

OXIDE	WT %	MOL WT	ATOMS	
WO3	0.08	231.80	0.002	W
Ta2O5	59.30	220.90	1.520	Ta
Nb2O5	7.95	132.90	0.339	Nb
TiO2	1.97	79.90	0.140	Ti
ZrO2	0.00	123.20	0.000	Zr
SnO2	0.00	150.70	0.000	Sn
Fe2O3	0.00	159.70	0.000	Fe+3
ThO2	0.00	264.00	0.000	Th
UO2	0.00	270.00	0.000	U+4
UO3	8.89	286.00	0.176	U+6
U3O8	0.00	842.00	0.000	U+8
Y2O3	0.00	112.90	0.000	Y
La2O3	0.00	162.90	0.000	La
Ce2O3	0.00	164.10	0.000	Ce
Pr2O3	0.00	164.90	0.000	Pr
Nd2O3	0.00	168.20	0.000	Nd
Sm2O3	0.00	174.40	0.000	Sm
Sb2O3	0.27	145.70	0.010	Sb+3
Bi2O3	0.00	233.00	0.000	Bi+3
MnO	1.56	70.94	0.124	Mn+2
FeO	0.02	71.85	0.002	Fe+2
CaO	13.10	56.08	1.322	Ca
SrO	0.00	103.60	0.000	Sr
BaO	0.00	153.30	0.000	Ba
PbO	1.59	223.20	0.040	Pb+2
Na2O	2.13	30.99	0.389	Na
K2O	0.00	47.10	0.000	K
Cs2O	0.00	140.90	0.000	Cs
F	1.35	19.00	0.402	F
H2O+	0.00	9.01	0.000	OH
H2O-	0.00	18.02	0.000	H2O
TOTAL	98.21		6.957	O
LESS O=F	0.57			
TOTAL	97.64			

A	B	O	(O	OH	F	) . 0.00 H2O
2.06	2.0	6.00	0.96	0.00	0.40	

(O + OH + F) = 1.36 Vacancies: -.06 A -.36 Y
Dose (alphas/mg) = 0.365E+18 DPA (displacements/atom) = 48.0

microlite Age = 0.130E+10 years

Cation abundances (decreasing order):

A = Ca ,Na ,U+6 ,Mn+2,Pb+2,Sb+3,Fe+2,K ,Pr ,Nd ,Sm ,La
Mean A valence = 2.16

B = Ta ,Nb ,Ti ,W ,Sn ,Zr ,Fe+3
Mean B valence = 4.93

OXIDE	WT %	MOL WT	ATOMS	
WO3	0.27	231.80	0.007	W
Ta2O5	63.90	220.90	1.670	Ta
Nb2O5	7.34	132.90	0.319	Nb
TiO2	0.06	79.90	0.004	Ti
ZrO2	0.00	123.20	0.000	Zr
SnO2	0.00	150.70	0.000	Sn
Fe2O3	0.00	159.70	0.000	Fe+3
ThO2	0.00	264.00	0.000	Th
UO2	0.00	270.00	0.000	U+4
UO3	7.61	286.00	0.154	U+6
U3O8	0.00	842.00	0.000	U+8
Y2O3	0.00	112.90	0.000	Y
La2O3	0.00	162.90	0.000	La
Ce2O3	0.00	164.10	0.000	Ce
Pr2O3	0.00	164.90	0.000	Pr
Nd2O3	0.00	168.20	0.000	Nd
Sm2O3	0.00	174.40	0.000	Sm
Sb2O3	0.19	145.70	0.008	Sb+3
Bi2O3	0.00	233.00	0.000	Bi+3
MnO	1.84	70.94	0.150	Mn+2
FeO	0.01	71.85	0.001	Fe+2
CaO	12.40	56.08	1.277	Ca
SrO	0.00	103.60	0.000	Sr
BaO	0.00	153.30	0.000	Ba
PbO	1.06	223.20	0.027	Pb+2
Na2O	2.39	30.99	0.445	Na
K2O	0.00	47.10	0.000	K
Cs2O	0.00	140.90	0.000	Cs
F	1.37	19.00	0.416	F
H2O+	0.00	9.01	0.000	OH
H2O-	0.00	18.02	0.000	H2O
TOTAL	98.44		6.942	O
LESS O=F	0.58			
TOTAL	97.86			

A	B	O	(O	OH	F	) . 0.00 H2O
2.06	2.0	6.00	0.94	0.00	0.42	

(O + OH + F) = 1.36 Vacancies: -.06 A -.36 Y
Dose (alphas/mg) = 0.311E+18 DPA (displacements/atom) = 41.8

microlite Age = 0.130E+10 years

Cation abundances (decreasing order):

A = Ca ,Na ,U+6 ,Mn+2,Pb+2,Sb+3,Fe+2,K ,Pr ,Nd ,Sm ,La
Mean A valence = 2.09

B = Ta ,Nb ,W ,Ti ,Sn ,Zr ,Fe+3
Mean B valence = 5.00

OXIDE	WT %	MOL WT	ATOMS	
WO3	0.48	231.80	0.012	W
Ta2O5	65.20	220.90	1.671	Ta
Nb2O5	7.34	132.90	0.313	Nb
TiO2	0.07	79.90	0.005	Ti
ZrO2	0.00	123.20	0.000	Zr
SnO2	0.00	150.70	0.000	Sn
Fe2O3	0.00	159.70	0.000	Fe+3
ThO2	0.00	264.00	0.000	Th
UO2	0.00	270.00	0.000	U+4
UO3	7.96	286.00	0.157	U+6
U3O8	0.00	842.00	0.000	U+8
Y2O3	0.00	112.90	0.000	Y
La2O3	0.00	162.90	0.000	La
Ce2O3	0.00	164.10	0.000	Ce
Pr2O3	0.00	164.90	0.000	Pr
Nd2O3	0.00	168.20	0.000	Nd
Sm2O3	0.00	174.40	0.000	Sm
Sb2O3	0.17	145.70	0.007	Sb+3
Bi2O3	0.00	233.00	0.000	Bi+3
MnO	0.75	70.94	0.060	Mn+2
FeO	0.03	71.85	0.002	Fe+2
CaO	11.90	56.08	1.201	Ca
SrO	0.00	103.60	0.000	Sr
BaO	0.00	153.30	0.000	Ba
PbO	1.62	223.20	0.041	Pb+2
Na2O	1.88	30.99	0.343	Na
K2O	0.00	47.10	0.000	K
Cs2O	0.00	140.90	0.000	Cs
F	0.53	19.00	0.158	F
H2O+	0.00	9.01	0.000	OH
H2O-	0.00	18.02	0.000	H2O
TOTAL	97.93		6.883	O
LESS O=F	0.22			
TOTAL	97.70			

A	B	O	(O	OH	F	) . 0.00 H2O
1.81	2.0	6.00	0.88	0.00	0.16	

(O + OH + F) = 1.04 Vacancies: 0.19 A -.04 Y
Dose (alphas/mg) = 0.326E+18 DPA (displacements/atom) = 45.1

microlite Age = 0.130E+10 years

Cation abundances (decreasing order):

A = Ca ,Na ,U+6 ,Mn+2,Pb+2,Sb+3,Fe+2,K ,Pr ,Nd ,Sm ,La
Mean A valence = 2.16

B = Ta ,Nb ,W ,Ti ,Sn ,Zr ,Fe+3
Mean B valence = 5.00

OXIDE	WT %	MOL WT	ATOMS	
WO3	0.39	231.80	0.010	W
Ta2O5	60.60	220.90	1.551	Ta
Nb2O5	10.20	132.90	0.434	Nb
TiO2	0.07	79.90	0.005	Ti
ZrO2	0.00	123.20	0.000	Zr
SnO2	0.00	150.70	0.000	Sn
Fe2O3	0.00	159.70	0.000	Fe+3
ThO2	0.00	264.00	0.000	Th
UO2	0.00	270.00	0.000	U+4
UO3	8.23	286.00	0.163	U+6
U3O8	0.00	842.00	0.000	U+8
Y2O3	0.00	112.90	0.000	Y
La2O3	0.00	162.90	0.000	La
Ce2O3	0.00	164.10	0.000	Ce
Pr2O3	0.00	164.90	0.000	Pr
Nd2O3	0.00	168.20	0.000	Nd
Sm2O3	0.00	174.40	0.000	Sm
Sb2O3	0.19	145.70	0.007	Sb+3
Bi2O3	0.00	233.00	0.000	Bi+3
MnO	1.52	70.94	0.121	Mn+2
FeO	0.01	71.85	0.001	Fe+2
CaO	11.60	56.08	1.170	Ca
SrO	0.00	103.60	0.000	Sr
BaO	0.00	153.30	0.000	Ba
PbO	1.27	223.20	0.032	Pb+2
Na2O	2.90	30.99	0.529	Na
K2O	0.00	47.10	0.000	K
Cs2O	0.00	140.90	0.000	Cs
F	1.19	19.00	0.354	F
H2O+	0.00	9.01	0.000	OH
H2O-	0.00	18.02	0.000	H2O
TOTAL	98.17		6.913	O
LESS O=F	0.50			
TOTAL	97.67			

A	B	O	(O	OH	F	) . 0.00 H2O
2.02	2.0	6.00	0.91	0.00	0.35	

(O + OH + F) = 1.27 Vacancies: -.02 A -.27 Y
Dose (alphas/mg) = 0.338E+18 DPA (displacements/atom) = 44.8

microlite Age = 0.130E+10 years

Cation abundances (decreasing order):

A = Ca ,Na ,U+6 ,Mn+2,Pb+2,Sb+3,Fe+2,K ,Pr ,Nd ,Sm ,La
Mean A valence = 2.06

B = Ta ,Nb ,W ,Ti ,Sn ,Zr ,Fe+3
Mean B valence = 5.00

OXIDE	WT %	MOL WT	ATOMS	
WO3	0.34	231.80	0.008	W
Ta2O5	64.20	220.90	1.668	Ta
Nb2O5	7.38	132.90	0.319	Nb
TiO2	0.07	79.90	0.005	Ti
ZrO2	0.00	123.20	0.000	Zr
SnO2	0.00	150.70	0.000	Sn
Fe2O3	0.00	159.70	0.000	Fe+3
ThO2	0.00	264.00	0.000	Th
UO2	0.00	270.00	0.000	U+4
UO3	7.53	286.00	0.151	U+6
U3O8	0.00	842.00	0.000	U+8
Y2O3	0.00	112.90	0.000	Y
La2O3	0.00	162.90	0.000	La
Ce2O3	0.00	164.10	0.000	Ce
Pr2O3	0.00	164.90	0.000	Pr
Nd2O3	0.00	168.20	0.000	Nd
Sm2O3	0.00	174.40	0.000	Sm
Sb2O3	0.17	145.70	0.007	Sb+3
Bi2O3	0.00	233.00	0.000	Bi+3
MnO	1.75	70.94	0.142	Mn+2
FeO	0.03	71.85	0.002	Fe+2
CaO	11.60	56.08	1.187	Ca
SrO	0.00	103.60	0.000	Sr
BaO	0.00	153.30	0.000	Ba
PbO	0.93	223.20	0.024	Pb+2
Na2O	2.38	30.99	0.441	Na
K2O	0.00	47.10	0.000	K
Cs2O	0.00	140.90	0.000	Cs
F	1.25	19.00	0.378	F
H2O+	0.00	9.01	0.000	OH
H2O-	0.00	18.02	0.000	H2O
TOTAL	97.63		6.852	O
LESS O=F	0.52			
TOTAL	97.11			

A	B	O	(O	OH	F	) . 0.00 H2O
1.95	2.0	6.00	0.85	0.00	0.38	

(O + OH + F) = 1.23 Vacancies: 0.05 A -.23 Y
Dose (alphas/mg) = 0.311E+18 DPA (displacements/atom) = 41.7

microlite Age = 0.130E+10 years

Cation abundances (decreasing order):

A = Ca ,Na ,U+6 ,Mn+2,Pb+2,Sb+3,Fe+2,K ,Pr ,Nd ,Sm ,La
Mean A valence = 2.09

B = Ta ,Nb ,W ,Ti ,Sn ,Zr ,Fe+3
Mean B valence = 5.00

Lepidolite-Cleavelandite Subunit

P02.1

OXIDE	WT %	MOL WT	ATOMS	
WO3	0.00	231.80	0.000	W
Ta2O5	59.40	220.90	1.504	Ta
Nb2O5	10.10	132.90	0.425	Nb
TiO2	1.00	79.90	0.070	Ti
ZrO2	0.00	123.20	0.000	Zr
SnO2	0.01	150.70	0.000	Sn
Fe2O3	0.00	159.70	0.000	Fe+3
ThO2	0.07	264.00	0.001	Th
UO2	0.00	270.00	0.000	U+4
UO3	9.40	286.00	0.184	U+6
U3O8	0.00	842.00	0.000	U+8
Y2O3	0.03	112.90	0.001	Y
La2O3	0.00	162.90	0.000	La
Ce2O3	0.15	164.10	0.005	Ce
Pr2O3	0.00	164.90	0.000	Pr
Nd2O3	0.00	168.20	0.000	Nd
Sm2O3	0.00	174.40	0.000	Sm
Sb2O3	0.25	145.70	0.010	Sb+3
Bi2O3	0.01	233.00	0.000	Bi+3
MnO	0.34	70.94	0.027	Mn+2
FeO	0.70	71.85	0.055	Fe+2
CaO	9.83	56.08	0.981	Ca
SrO	0.00	103.60	0.000	Sr
BaO	0.03	153.30	0.001	Ba
PbO	0.26	223.20	0.007	Pb+2
Na2O	3.23	30.99	0.583	Na
K2O	0.00	47.10	0.000	K
Cs2O	0.00	140.90	0.000	Cs
F	1.46	19.00	0.430	F
H2O+	0.00	9.01	0.000	OH
H2O-	0.00	18.02	0.000	H2O
TOTAL	96.27		6.690	O
LESS O=F	0.61			
TOTAL	95.65			

A	B	O	(O	OH	F	) . 0.00 H2O
1.85	2.0	6.00	0.69	0.00	0.43	

(O + OH + F) = 1.12 Vacancies: 0.15 A -.12 Y

Dose (alphas/mg) = 0.394E+18 DPA (displacements/atom) = 51.0

microlite Age = 0.130E+10 years

Cation abundances (decreasing order):

A = Ca ,Na ,U+6 ,Fe+2,Mn+2,Sb+3,Pb+2,Ce ,Y ,Th ,Ba ,Bi+3
Mean A valence = 2.09

B = Ta ,Nb ,Ti ,Sn ,W ,Zr ,Fe+3
Mean B valence = 4.96

P02.1

OXIDE	WT %	MOL WT	ATOMS	
WO3	0.17	231.80	0.004	W
Ta2O5	66.50	220.90	1.684	Ta
Nb2O5	7.30	132.90	0.307	Nb
TiO2	0.07	79.90	0.005	Ti
ZrO2	0.00	123.20	0.000	Zr
SnO2	0.00	150.70	0.000	Sn
Fe2O3	0.00	159.70	0.000	Fe+3
ThO2	0.00	264.00	0.000	Th
UO2	0.00	270.00	0.000	U+4
UO3	7.00	286.00	0.137	U+6
U3O8	0.00	842.00	0.000	U+8
Y2O3	0.01	112.90	0.000	Y
La2O3	0.00	162.90	0.000	La
Ce2O3	0.16	164.10	0.005	Ce
Pr2O3	0.00	164.90	0.000	Pr
Nd2O3	0.00	168.20	0.000	Nd
Sm2O3	0.00	174.40	0.000	Sm
Sb2O3	0.07	145.70	0.003	Sb+3
Bi2O3	0.00	233.00	0.000	Bi+3
MnO	0.42	70.94	0.033	Mn+2
FeO	0.20	71.85	0.016	Fe+2
CaO	9.76	56.08	0.973	Ca
SrO	0.00	103.60	0.000	Sr
BaO	0.01	153.30	0.000	Ba
PbO	0.23	223.20	0.006	Pb+2
Na2O	3.63	30.99	0.655	Na
K2O	0.00	47.10	0.000	K
Cs2O	0.00	140.90	0.000	Cs
F	1.64	19.00	0.483	F
H2O+	0.00	9.01	0.000	OH
H2O-	0.00	18.02	0.000	H2O
TOTAL	97.17		6.538	O
LESS O=F	0.69			
TOTAL	96.48			

A	B	O	(O	OH	F	) . 0.00 H2O
1.83	2.0	6.00	0.54	0.00	0.48	

(O + OH + F) = 1.02 Vacancies: 0.17 A -.02 Y
Dose (alphas/mg) = 0.291E+18 DPA (displacements/atom) = 37.9

microlite Age = 0.130E+10 years

Cation abundances (decreasing order):

A = Ca ,Na ,U+6 ,Mn+2,Fe+2,Pb+2,Ce ,Sb+3,Y ,Ba ,K ,Pr
Mean A valence = 1.95

B = Ta ,Nb ,Ti ,W ,Sn ,Zr ,Fe+3
Mean B valence = 5.00

P02.1

OXIDE	WT %	MOL WT	ATOMS	
WO3	0.39	231.80	0.009	W
Ta2O5	67.60	220.90	1.679	Ta
Nb2O5	7.41	132.90	0.306	Nb
TiO2	0.05	79.90	0.003	Ti
ZrO2	0.00	123.20	0.000	Zr
SnO2	0.07	150.70	0.003	Sn
Fe2O3	0.00	159.70	0.000	Fe+3
ThO2	0.03	264.00	0.001	Th
UO2	0.00	270.00	0.000	U+4
UO3	7.01	286.00	0.135	U+6
U3O8	0.00	842.00	0.000	U+8
Y2O3	0.03	112.90	0.001	Y
La2O3	0.00	162.90	0.000	La
Ce2O3	0.08	164.10	0.003	Ce
Pr2O3	0.00	164.90	0.000	Pr
Nd2O3	0.00	168.20	0.000	Nd
Sm2O3	0.00	174.40	0.000	Sm
Sb2O3	0.11	145.70	0.004	Sb+3
Bi2O3	0.02	233.00	0.000	Bi+3
MnO	0.28	70.94	0.022	Mn+2
FeO	0.30	71.85	0.023	Fe+2
CaO	8.53	56.08	0.834	Ca
SrO	0.00	103.60	0.000	Sr
BaO	0.00	153.30	0.000	Ba
PbO	0.27	223.20	0.007	Pb+2
Na2O	3.92	30.99	0.694	Na
K2O	0.00	47.10	0.000	K
Cs2O	0.00	140.90	0.000	Cs
F	1.61	19.00	0.465	F
H2O+	0.00	9.01	0.000	OH
H2O-	0.00	18.02	0.000	H2O
TOTAL	97.71		6.420	O
LESS O=F	0.68			
TOTAL	97.04			

A	B	O	(O	OH	F	) . 0.00 H2O
1.72	2.0	6.00	0.42	0.00	0.46	

(O + OH + F) = 0.88 Vacancies: 0.28 A 0.12 Y

Dose (alphas/mg) = 0.290E+18 DPA (displacements/atom) = 37.7

microlite Age = 0.130E+10 years

Cation abundances (decreasing order):

A = Ca ,Na ,U+6 ,Fe+2,Mn+2,Pb+2,Sb+3,Ce ,Y ,Th ,Bi+3,K
Mean A valence = 1.92

B = Ta ,Nb ,W ,Ti ,Sn ,Zr ,Fe+3
Mean B valence = 5.00

P02.1

OXIDE	WT %	MOL WT	ATOMS	
WO3	0.25	231.80	0.006	W
Ta2O5	66.90	220.90	1.679	Ta
Nb2O5	7.45	132.90	0.311	Nb
TiO2	0.05	79.90	0.003	Ti
ZrO2	0.00	123.20	0.000	Zr
SnO2	0.01	150.70	0.000	Sn
Fe2O3	0.00	159.70	0.000	Fe+3
ThO2	0.06	264.00	0.001	Th
UO2	0.00	270.00	0.000	U+4
UO3	7.44	286.00	0.144	U+6
U3O8	0.00	842.00	0.000	U+8
Y2O3	0.03	112.90	0.001	Y
La2O3	0.00	162.90	0.000	La
Ce2O3	0.11	164.10	0.004	Ce
Pr2O3	0.00	164.90	0.000	Pr
Nd2O3	0.00	168.20	0.000	Nd
Sm2O3	0.00	174.40	0.000	Sm
Sb2O3	0.10	145.70	0.004	Sb+3
Bi2O3	0.00	233.00	0.000	Bi+3
MnO	0.24	70.94	0.019	Mn+2
FeO	0.29	71.85	0.022	Fe+2
CaO	9.57	56.08	0.946	Ca
SrO	0.00	103.60	0.000	Sr
BaO	0.00	153.30	0.000	Ba
PbO	0.19	223.20	0.005	Pb+2
Na2O	3.42	30.99	0.612	Na
K2O	0.00	47.10	0.000	K
Cs2O	0.00	140.90	0.000	Cs
F	1.62	19.00	0.473	F
H2O+	0.00	9.01	0.000	OH
H2O-	0.00	18.02	0.000	H2O
TOTAL	97.73		6.511	O
LESS O=F	0.68			
TOTAL	97.05			

A	B	O	(O	OH	F	) . 0.00 H2O
1.76	2.0	6.00	0.51	0.00	0.47	

(O + OH + F) = 0.98 Vacancies: 0.24 A 0.02 Y

Dose (alphas/mg) = 0.307E+18 DPA (displacements/atom) = 40.2

microlite Age = 0.130E+10 years

Cation abundances (decreasing order):

A = Ca ,Na ,U+6 ,Fe+2,Mn+2,Pb+2,Sb+3,Ce ,Y ,Th ,K ,Pr
Mean A valence = 1.99

B = Ta ,Nb ,W ,Ti ,Sn ,Zr ,Fe+3
Mean B valence = 5.00

P02.1

OXIDE	WT %	MOL WT	ATOMS	
WO3	0.05	231.80	0.001	W
Ta2O5	63.20	220.90	1.613	Ta
Nb2O5	9.04	132.90	0.383	Nb
TiO2	0.04	79.90	0.003	Ti
ZrO2	0.00	123.20	0.000	Zr
SnO2	0.00	150.70	0.000	Sn
Fe2O3	0.00	159.70	0.000	Fe+3
ThO2	0.00	264.00	0.000	Th
UO2	0.00	270.00	0.000	U+4
UO3	7.30	286.00	0.144	U+6
U3O8	0.00	842.00	0.000	U+8
Y2O3	0.03	112.90	0.001	Y
La2O3	0.00	162.90	0.000	La
Ce2O3	0.11	164.10	0.004	Ce
Pr2O3	0.00	164.90	0.000	Pr
Nd2O3	0.00	168.20	0.000	Nd
Sm2O3	0.00	174.40	0.000	Sm
Sb2O3	0.11	145.70	0.004	Sb+3
Bi2O3	0.01	233.00	0.000	Bi+3
MnO	0.32	70.94	0.025	Mn+2
FeO	0.46	71.85	0.036	Fe+2
CaO	11.10	56.08	1.116	Ca
SrO	0.00	103.60	0.000	Sr
BaO	0.00	153.30	0.000	Ba
PbO	0.27	223.20	0.007	Pb+2
Na2O	2.64	30.99	0.480	Na
K2O	0.00	47.10	0.000	K
Cs2O	0.04	140.90	0.002	Cs
F	1.60	19.00	0.475	F
H2O+	0.00	9.01	0.000	OH
H2O-	0.00	18.02	0.000	H2O
TOTAL	96.32		6.633	O
LESS O=F	0.67			
TOTAL	95.65			

A	B	O	(O	OH	F	) . 0.00 H2O
1.82	2.0	6.00	0.63	0.00	0.47	

(O + OH + F) = 1.11 Vacancies: 0.18 A -.11 Y
Dose (alphas/mg) = 0.306E+18 DPA (displacements/atom) = 39.9

microlite Age = 0.130E+10 years

Cation abundances (decreasing order):

A = Ca ,Na ,U+6 ,Fe+2,Mn+2,Pb+2,Sb+3,Ce ,Y ,Bi+3,K ,Pr
Mean A valence = 2.06

B = Ta ,Nb ,Ti ,W ,Sn ,Zr ,Fe+3
Mean B valence = 5.00

P02.1

OXIDE	WT %	MOL WT	ATOMS	
WO3	0.06	231.80	0.001	W
Ta2O5	65.90	220.90	1.617	Ta
Nb2O5	9.10	132.90	0.371	Nb
TiO2	0.15	79.90	0.010	Ti
ZrO2	0.00	123.20	0.000	Zr
SnO2	0.02	150.70	0.001	Sn
Fe2O3	0.00	159.70	0.000	Fe+3
ThO2	0.07	264.00	0.001	Th
UO2	0.00	270.00	0.000	U+4
UO3	7.88	286.00	0.149	U+6
U3O8	0.00	842.00	0.000	U+8
Y2O3	0.05	112.90	0.002	Y
La2O3	0.00	162.90	0.000	La
Ce2O3	0.14	164.10	0.005	Ce
Pr2O3	0.00	164.90	0.000	Pr
Nd2O3	0.00	168.20	0.000	Nd
Sm2O3	0.00	174.40	0.000	Sm
Sb2O3	0.12	145.70	0.004	Sb+3
Bi2O3	0.00	233.00	0.000	Bi+3
MnO	0.08	70.94	0.006	Mn+2
FeO	0.08	71.85	0.006	Fe+2
CaO	7.91	56.08	0.764	Ca
SrO	0.00	103.60	0.000	Sr
BaO	0.00	153.30	0.000	Ba
PbO	0.26	223.20	0.006	Pb+2
Na2O	4.81	30.99	0.841	Na
K2O	0.00	47.10	0.000	K
Cs2O	0.00	140.90	0.000	Cs
F	2.05	19.00	0.585	F
H2O+	0.00	9.01	0.000	OH
H2O-	0.00	18.02	0.000	H2O
TOTAL	98.68		6.374	O
LESS O=F	0.86			
TOTAL	97.82			

A	B	O	(O	OH	F	) . 0.00 H2O
1.79	2.0	6.00	0.37	0.00	0.58	

(O + OH + F) = 0.96 Vacancies: 0.21 A 0.04 Y

Dose (alphas/mg) = 0.323E+18 DPA (displacements/atom) = 41.1

microlite Age = 0.130E+10 years

Cation abundances (decreasing order):

A = Na ,Ca ,U+6 ,Pb+2,Mn+2,Fe+2,Ce ,Sb+3,Y ,Th ,K ,Pr
Mean A valence = 1.87

B = Ta ,Nb ,Ti ,W ,Sn ,Zr ,Fe+3
Mean B valence = 5.00

P02.1

OXIDE	WT %	MOL WT	ATOMS	
WO3	0.01	231.80	0.000	W
Ta2O5	61.40	220.90	1.579	Ta
Nb2O5	8.45	132.90	0.361	Nb
TiO2	0.83	79.90	0.059	Ti
ZrO2	0.00	123.20	0.000	Zr
SnO2	0.00	150.70	0.000	Sn
Fe2O3	0.00	159.70	0.000	Fe+3
ThO2	0.00	264.00	0.000	Th
UO2	0.00	270.00	0.000	U+4
UO3	8.71	286.00	0.173	U+6
U3O8	0.00	842.00	0.000	U+8
Y2O3	0.04	112.90	0.002	Y
La2O3	0.00	162.90	0.000	La
Ce2O3	0.12	164.10	0.004	Ce
Pr2O3	0.00	164.90	0.000	Pr
Nd2O3	0.00	168.20	0.000	Nd
Sm2O3	0.00	174.40	0.000	Sm
Sb2O3	0.30	145.70	0.012	Sb+3
Bi2O3	0.07	233.00	0.002	Bi+3
MnO	0.54	70.94	0.043	Mn+2
FeO	0.49	71.85	0.039	Fe+2
CaO	10.20	56.08	1.034	Ca
SrO	0.00	103.60	0.000	Sr
BaO	0.02	153.30	0.001	Ba
PbO	0.23	223.20	0.006	Pb+2
Na2O	3.28	30.99	0.601	Na
K2O	0.00	47.10	0.000	K
Cs2O	0.00	140.90	0.000	Cs
F	1.96	19.00	0.586	F
H2O+	0.00	9.01	0.000	OH
H2O-	0.00	18.02	0.000	H2O
TOTAL	96.65		6.649	O
LESS O=F	0.82			
TOTAL	95.82			

A	B	O	(O	OH	F	) . 0.00 H2O
1.92	2.0	6.00	0.65	0.00	0.59	

(O + OH + F) = 1.23 Vacancies: 0.08 A -.23 Y
Dose (alphas/mg) = 0.364E+18 DPA (displacements/atom) = 47.0

microlite Age = 0.130E+10 years

Cation abundances (decreasing order):

A = Ca ,Na ,U+6 ,Mn+2,Fe+2,Sb+3,Pb+2,Ce ,Y ,Bi+3,Ba ,K
Mean A valence = 2.06

B = Ta ,Nb ,Ti ,W ,Sn ,Zr ,Fe+3
Mean B valence = 4.97

P02.2

OXIDE	WT %	MOL WT	ATOMS	
WO3	0.09	231.80	0.002	W
Ta2O5	68.50	220.90	1.672	Ta
Nb2O5	6.98	132.90	0.283	Nb
TiO2	0.63	79.90	0.043	Ti
ZrO2	0.00	123.20	0.000	Zr
SnO2	0.00	150.70	0.000	Sn
Fe2O3	0.00	159.70	0.000	Fe+3
ThO2	0.03	264.00	0.001	Th
UO2	0.00	270.00	0.000	U+4
UO3	3.95	286.00	0.074	U+6
U3O8	0.00	842.00	0.000	U+8
Y2O3	0.05	112.90	0.002	Y
La2O3	0.00	162.90	0.000	La
Ce2O3	0.19	164.10	0.006	Ce
Pr2O3	0.00	164.90	0.000	Pr
Nd2O3	0.00	168.20	0.000	Nd
Sm2O3	0.00	174.40	0.000	Sm
Sb2O3	0.21	145.70	0.008	Sb+3
Bi2O3	0.15	233.00	0.003	Bi+3
MnO	0.03	70.94	0.002	Mn+2
FeO	0.08	71.85	0.006	Fe+2
CaO	9.49	56.08	0.913	Ca
SrO	0.00	103.60	0.000	Sr
BaO	0.00	153.30	0.000	Ba
PbO	0.13	223.20	0.003	Pb+2
Na2O	3.75	30.99	0.653	Na
K2O	0.00	47.10	0.000	K
Cs2O	0.01	140.90	0.000	Cs
F	1.80	19.00	0.511	F
H2O+	0.00	9.01	0.000	OH
H2O-	0.00	18.02	0.000	H2O
TOTAL	96.07		6.229	O
LESS O=F	0.76			
TOTAL	95.32			

A	B	O	(O	OH	F	) . 0.00 H2O
1.67	2.0	6.00	0.23	0.00	0.51	

(O + OH + F) = 0.74 Vacancies: 0.33 A 0.26 Y

Dose (alphas/mg) = 0.166E+18 DPA (displacements/atom) = 20.9

microlite Age = 0.130E+10 years

Cation abundances (decreasing order):

A = Ca ,Na ,U+6 ,Sb+3,Ce ,Fe+2,Bi+3,Pb+2,Y ,Mn+2,Th ,K

Mean A valence = 1.80

B = Ta ,Nb ,Ti ,W ,Sn ,Zr ,Fe+3

Mean B valence = 4.98

P02.2

OXIDE	WT %	MOL WT	ATOMS	
WO3	0.14	231.80	0.003	W
Ta2O5	68.40	220.90	1.638	Ta
Nb2O5	7.80	132.90	0.310	Nb
TiO2	0.73	79.90	0.048	Ti
ZrO2	0.00	123.20	0.000	Zr
SnO2	0.00	150.70	0.000	Sn
Fe2O3	0.00	159.70	0.000	Fe+3
ThO2	0.06	264.00	0.001	Th
UO2	0.00	270.00	0.000	U+4
UO3	4.41	286.00	0.082	U+6
U3O8	0.00	842.00	0.000	U+8
Y2O3	0.10	112.90	0.005	Y
La2O3	0.00	162.90	0.000	La
Ce2O3	0.13	164.10	0.004	Ce
Pr2O3	0.00	164.90	0.000	Pr
Nd2O3	0.00	168.20	0.000	Nd
Sm2O3	0.00	174.40	0.000	Sm
Sb2O3	0.21	145.70	0.008	Sb+3
Bi2O3	0.00	233.00	0.000	Bi+3
MnO	0.04	70.94	0.003	Mn+2
FeO	0.07	71.85	0.005	Fe+2
CaO	11.20	56.08	1.056	Ca
SrO	0.00	103.60	0.000	Sr
BaO	0.00	153.30	0.000	Ba
PbO	0.09	223.20	0.002	Pb+2
Na2O	3.87	30.99	0.661	Na
K2O	0.00	47.10	0.000	K
Cs2O	0.02	140.90	0.001	Cs
F	2.13	19.00	0.593	F
H2O+	0.00	9.01	0.000	OH
H2O-	0.00	18.02	0.000	H2O
TOTAL	99.40		6.350	O
LESS O=F	0.89			
TOTAL	98.50			

A	B	O	(O	OH	F	) . 0.00 H2O
1.83	2.0	6.00	0.35	0.00	0.59	

(O + OH + F) = 0.94 Vacancies: 0.17 A 0.06 Y
Dose (alphas/mg) = 0.179E+18 DPA (displacements/atom) = 22.3

microlite Age = 0.130E+10 years

Cation abundances (decreasing order):

A = Ca ,Na ,U+6 ,Sb+3,Fe+2,Y ,Ce ,Mn+2,Pb+2,Th ,K ,U+8
Mean A valence = 1.83

B = Ta ,Nb ,Ti ,W ,Sn ,Zr ,Fe+3
Mean B valence = 4.98

P02.2

OXIDE	WT %	MOL WT	ATOMS	
WO3	0.10	231.80	0.002	W
Ta2O5	68.50	220.90	1.638	Ta
Nb2O5	7.78	132.90	0.309	Nb
TiO2	0.76	79.90	0.050	Ti
ZrO2	0.00	123.20	0.000	Zr
SnO2	0.00	150.70	0.000	Sn
Fe2O3	0.00	159.70	0.000	Fe+3
ThO2	0.05	264.00	0.001	Th
UO2	0.00	270.00	0.000	U+4
UO3	4.49	286.00	0.083	U+6
U3O8	0.00	842.00	0.000	U+8
Y2O3	0.08	112.90	0.004	Y
La2O3	0.00	162.90	0.000	La
Ce2O3	0.16	164.10	0.005	Ce
Pr2O3	0.00	164.90	0.000	Pr
Nd2O3	0.00	168.20	0.000	Nd
Sm2O3	0.00	174.40	0.000	Sm
Sb2O3	0.16	145.70	0.006	Sb+3
Bi2O3	0.05	233.00	0.001	Bi+3
MnO	0.33	70.94	0.025	Mn+2
FeO	0.27	71.85	0.020	Fe+2
CaO	9.90	56.08	0.933	Ca
SrO	0.00	103.60	0.000	Sr
BaO	0.00	153.30	0.000	Ba
PbO	0.10	223.20	0.002	Pb+2
Na2O	4.56	30.99	0.777	Na
K2O	0.00	47.10	0.000	K
Cs2O	0.00	140.90	0.000	Cs
F	1.96	19.00	0.545	F
H2O+	0.00	9.01	0.000	OH
H2O-	0.00	18.02	0.000	H2O
TOTAL	99.25		6.346	O
LESS O=F	0.82			
TOTAL	98.43			

A	B	O	(O	OH	F	) . 0.00 H2O
1.86	2.0	6.00	0.35	0.00	0.54	

(O + OH + F) = 0.89 Vacancies: 0.14 A 0.11 Y

Dose (alphas/mg) = 0.183E+18 DPA (displacements/atom) = 22.8

microlite Age = 0.130E+10 years

Cation abundances (decreasing order):

A = Ca ,Na ,U+6 ,Mn+2,Fe+2,Sb+3,Ce ,Y ,Pb+2,Bi+3,Th ,K
Mean A valence = 1.77

B = Ta ,Nb ,Ti ,W ,Sn ,Zr ,Fe+3
Mean B valence = 4.98

P02.2

OXIDE	WT %	MOL WT	ATOMS	
WO3	0.13	231.80	0.003	W
Ta2O5	68.10	220.90	1.646	Ta
Nb2O5	7.50	132.90	0.301	Nb
TiO2	0.74	79.90	0.049	Ti
ZrO2	0.00	123.20	0.000	Zr
SnO2	0.00	150.70	0.000	Sn
Fe2O3	0.00	159.70	0.000	Fe+3
ThO2	0.03	264.00	0.001	Th
UO2	0.00	270.00	0.000	U+4
UO3	4.19	286.00	0.078	U+6
U3O8	0.00	842.00	0.000	U+8
Y2O3	0.08	112.90	0.004	Y
La2O3	0.00	162.90	0.000	La
Ce2O3	0.16	164.10	0.005	Ce
Pr2O3	0.00	164.90	0.000	Pr
Nd2O3	0.00	168.20	0.000	Nd
Sm2O3	0.00	174.40	0.000	Sm
Sb2O3	0.15	145.70	0.005	Sb+3
Bi2O3	0.09	233.00	0.002	Bi+3
MnO	0.12	70.94	0.009	Mn+2
FeO	0.27	71.85	0.020	Fe+2
CaO	12.10	56.08	1.152	Ca
SrO	0.00	103.60	0.000	Sr
BaO	0.01	153.30	0.000	Ba
PbO	0.10	223.20	0.002	Pb+2
Na2O	3.57	30.99	0.615	Na
K2O	0.00	47.10	0.000	K
Cs2O	0.00	140.90	0.000	Cs
F	2.10	19.00	0.590	F
H2O+	0.00	9.01	0.000	OH
H2O-	0.00	18.02	0.000	H2O
TOTAL	99.44		6.434	O
LESS O=F	0.88			
TOTAL	98.56			

A	B	O	(O	OH	F	) . 0.00 H2O
1.89	2.0	6.00	0.43	0.00	0.59	

(O + OH + F) = 1.02 Vacancies: 0.11 A -.02 Y

Dose (alphas/mg) = 0.170E+18 DPA (displacements/atom) = 21.3

microlite Age = 0.130E+10 years

Cation abundances (decreasing order):

A = Ca ,Na ,U+6 ,Fe+2,Mn+2,Sb+3,Ce ,Y ,Pb+2,Bi+3,Th ,Ba
Mean A valence = 1.85

B = Ta ,Nb ,Ti ,W ,Sn ,Zr ,Fe+3
Mean B valence = 4.98

P02.2

OXIDE	WT %	MOL WT	ATOMS	
WO3	0.06	231.80	0.001	W
Ta2O5	68.40	220.90	1.704	Ta
Nb2O5	6.03	132.90	0.250	Nb
TiO2	0.65	79.90	0.045	Ti
ZrO2	0.00	123.20	0.000	Zr
SnO2	0.01	150.70	0.000	Sn
Fe2O3	0.00	159.70	0.000	Fe+3
ThO2	0.00	264.00	0.000	Th
UO2	0.00	270.00	0.000	U+4
UO3	3.93	286.00	0.076	U+6
U3O8	0.00	842.00	0.000	U+8
Y2O3	0.10	112.90	0.005	Y
La2O3	0.00	162.90	0.000	La
Ce2O3	0.22	164.10	0.007	Ce
Pr2O3	0.00	164.90	0.000	Pr
Nd2O3	0.00	168.20	0.000	Nd
Sm2O3	0.00	174.40	0.000	Sm
Sb2O3	0.20	145.70	0.008	Sb+3
Bi2O3	0.06	233.00	0.001	Bi+3
MnO	0.15	70.94	0.012	Mn+2
FeO	0.33	71.85	0.025	Fe+2
CaO	6.10	56.08	0.599	Ca
SrO	0.00	103.60	0.000	Sr
BaO	0.05	153.30	0.002	Ba
PbO	0.17	223.20	0.004	Pb+2
Na2O	0.55	30.99	0.098	Na
K2O	0.00	47.10	0.000	K
Cs2O	0.00	140.90	0.000	Cs
F	0.67	19.00	0.194	F
H2O+	0.00	9.01	0.000	OH
H2O-	0.00	18.02	0.000	H2O
TOTAL	87.68		5.830	O
LESS O=F	0.28			
TOTAL	87.40			

A	B	O	(O	OH	F	) . 0.00 H2O
0.84	2.0	5.83	0.00	0.00	0.19	

(O + OH + F) = 0.19 Vacancies: 1.16 A 0.81 Y
Dose (alphas/mg) = 0.180E+18 DPA (displacements/atom) = 24.4

microlite Age = 0.130E+10 years

Cation abundances (decreasing order):

A = Ca ,Na ,U+6 ,Fe+2,Mn+2,Sb+3,Ce ,Y ,Pb+2,Ba ,Bi+3,K
Mean A valence = 2.27

B = Ta ,Nb ,Ti ,W ,Sn ,Zr ,Fe+3
Mean B valence = 4.98

P07.1

OXIDE	WT %	MOL WT	ATOMS	
WO3	0.18	231.80	0.004	W
Ta2O5	66.60	220.90	1.630	Ta
Nb2O5	7.29	132.90	0.296	Nb
TiO2	1.02	79.90	0.069	Ti
ZrO2	0.00	123.20	0.000	Zr
SnO2	0.02	150.70	0.001	Sn
Fe2O3	0.00	159.70	0.000	Fe+3
ThO2	0.08	264.00	0.002	Th
UO2	0.00	270.00	0.000	U+4
UO3	6.76	286.00	0.128	U+6
U3O8	0.00	842.00	0.000	U+8
Y2O3	0.10	112.90	0.005	Y
La2O3	0.00	162.90	0.000	La
Ce2O3	0.21	164.10	0.007	Ce
Pr2O3	0.00	164.90	0.000	Pr
Nd2O3	0.00	168.20	0.000	Nd
Sm2O3	0.00	174.40	0.000	Sm
Sb2O3	0.08	145.70	0.003	Sb+3
Bi2O3	0.00	233.00	0.000	Bi+3
MnO	0.38	70.94	0.029	Mn+2
FeO	0.19	71.85	0.014	Fe+2
CaO	9.98	56.08	0.962	Ca
SrO	0.00	103.60	0.000	Sr
BaO	0.06	153.30	0.002	Ba
PbO	0.20	223.20	0.005	Pb+2
Na2O	3.92	30.99	0.684	Na
K2O	0.00	47.10	0.000	K
Cs2O	0.00	140.90	0.000	Cs
F	1.91	19.00	0.543	F
H2O+	0.00	9.01	0.000	OH
H2O-	0.00	18.02	0.000	H2O
TOTAL	98.98		6.458	O
LESS O=F	0.80			
TOTAL	98.18			

A	B	O	(O	OH	F	) . 0.00 H2O
1.84	2.0	6.00	0.46	0.00	0.54	

(O + OH + F) = 1.00 Vacancies: 0.16 A 0.00 Y

Dose (alphas/mg) = 0.276E+18 DPA (displacements/atom) = 35.1

microlite Age = 0.130E+10 years

Cation abundances (decreasing order):

A = Ca ,Na ,U+6 ,Mn+2,Fe+2,Ce ,Pb+2,Y ,Sb+3,Ba ,Th ,K
Mean A valence = 1.92

B = Ta ,Nb ,Ti ,W ,Sn ,Zr ,Fe+3
Mean B valence = 4.97

P07.1

OXIDE	WT %	MOL WT	ATOMS	
WO3	0.30	231.80	0.007	W
Ta2O5	69.10	220.90	1.702	Ta
Nb2O5	6.70	132.90	0.274	Nb
TiO2	0.23	79.90	0.016	Ti
ZrO2	0.00	123.20	0.000	Zr
SnO2	0.04	150.70	0.001	Sn
Fe2O3	0.00	159.70	0.000	Fe+3
ThO2	0.00	264.00	0.000	Th
UO2	0.00	270.00	0.000	U+4
UO3	5.02	286.00	0.096	U+6
U3O8	0.00	842.00	0.000	U+8
Y2O3	0.09	112.90	0.004	Y
La2O3	0.00	162.90	0.000	La
Ce2O3	0.24	164.10	0.008	Ce
Pr2O3	0.00	164.90	0.000	Pr
Nd2O3	0.00	168.20	0.000	Nd
Sm2O3	0.00	174.40	0.000	Sm
Sb2O3	0.11	145.70	0.004	Sb+3
Bi2O3	0.00	233.00	0.000	Bi+3
MnO	0.23	70.94	0.018	Mn+2
FeO	0.76	71.85	0.058	Fe+2
CaO	10.90	56.08	1.057	Ca
SrO	0.00	103.60	0.000	Sr
BaO	0.04	153.30	0.001	Ba
PbO	0.12	223.20	0.003	Pb+2
Na2O	3.68	30.99	0.646	Na
K2O	0.00	47.10	0.000	K
Cs2O	0.00	140.90	0.000	Cs
F	2.20	19.00	0.630	F
H2O+	0.00	9.01	0.000	OH
H2O-	0.00	18.02	0.000	H2O
TOTAL	99.76		6.451	O
LESS O=F	0.92			
TOTAL	98.84			

A	B	O	(O	OH	F	) . 0.00 H2O
1.89	2.0	6.00	0.45	0.00	0.63	

(O + OH + F) = 1.08 Vacancies: 0.11 A -.08 Y
Dose (alphas/mg) = 0.204E+18 DPA (displacements/atom) = 25.9

microlite Age = 0.130E+10 years

Cation abundances (decreasing order):

A = Ca ,Na ,U+6 ,Fe+2,Mn+2,Ce ,Y ,Sb+3,Pb+2,Ba ,K ,Pr
Mean A valence = 1.87

B = Ta ,Nb ,Ti ,W ,Sn ,Zr ,Fe+3
Mean B valence = 4.99

P07.1

OXIDE	WT %	MOL WT	ATOMS	
WO3	0.30	231.80	0.007	W
Ta2O5	66.90	220.90	1.631	Ta
Nb2O5	7.20	132.90	0.292	Nb
TiO2	1.03	79.90	0.069	Ti
ZrO2	0.00	123.20	0.000	Zr
SnO2	0.04	150.70	0.001	Sn
Fe2O3	0.00	159.70	0.000	Fe+3
ThO2	0.00	264.00	0.000	Th
UO2	0.00	270.00	0.000	U+4
UO3	6.67	286.00	0.126	U+6
U3O8	0.00	842.00	0.000	U+8
Y2O3	0.10	112.90	0.005	Y
La2O3	0.00	162.90	0.000	La
Ce2O3	0.17	164.10	0.006	Ce
Pr2O3	0.00	164.90	0.000	Pr
Nd2O3	0.00	168.20	0.000	Nd
Sm2O3	0.00	174.40	0.000	Sm
Sb2O3	0.09	145.70	0.003	Sb+3
Bi2O3	0.00	233.00	0.000	Bi+3
MnO	0.31	70.94	0.024	Mn+2
FeO	0.28	71.85	0.021	Fe+2
CaO	10.00	56.08	0.960	Ca
SrO	0.00	103.60	0.000	Sr
BaO	0.03	153.30	0.001	Ba
PbO	0.26	223.20	0.006	Pb+2
Na2O	3.48	30.99	0.605	Na
K2O	0.00	47.10	0.000	K
Cs2O	0.00	140.90	0.000	Cs
F	1.67	19.00	0.473	F
H2O+	0.00	9.01	0.000	OH
H2O-	0.00	18.02	0.000	H2O
TOTAL	98.53		6.443	O
LESS O=F	0.70			
TOTAL	97.83			

A	B	O	(O	OH	F	) . 0.00 H2O
1.76	2.0	6.00	0.44	0.00	0.47	

(O + OH + F) = 0.92 Vacancies: 0.24 A 0.08 Y

Dose (alphas/mg) = 0.273E+18 DPA (displacements/atom) = 35.0

microlite Age = 0.130E+10 years

Cation abundances (decreasing order):

A = Ca ,Na ,U+6 ,Mn+2,Fe+2,Pb+2,Ce ,Y ,Sb+3,Ba ,K ,Nd
Mean A valence = 1.95

B = Ta ,Nb ,Ti ,W ,Sn ,Zr ,Fe+3
Mean B valence = 4.97

P07.1

OXIDE	WT %	MOL WT	ATOMS	
WO3	0.24	231.80	0.006	W
Ta2O5	63.40	220.90	1.618	Ta
Nb2O5	7.08	132.90	0.300	Nb
TiO2	1.06	79.90	0.075	Ti
ZrO2	0.00	123.20	0.000	Zr
SnO2	0.04	150.70	0.001	Sn
Fe2O3	0.00	159.70	0.000	Fe+3
ThO2	0.00	264.00	0.000	Th
UO2	0.00	270.00	0.000	U+4
UO3	6.74	286.00	0.133	U+6
U3O8	0.00	842.00	0.000	U+8
Y2O3	0.11	112.90	0.005	Y
La2O3	0.00	162.90	0.000	La
Ce2O3	0.10	164.10	0.003	Ce
Pr2O3	0.00	164.90	0.000	Pr
Nd2O3	0.00	168.20	0.000	Nd
Sm2O3	0.00	174.40	0.000	Sm
Sb2O3	0.16	145.70	0.006	Sb+3
Bi2O3	0.00	233.00	0.000	Bi+3
MnO	0.35	70.94	0.028	Mn+2
FeO	0.63	71.85	0.049	Fe+2
CaO	12.70	56.08	1.276	Ca
SrO	0.00	103.60	0.000	Sr
BaO	0.03	153.30	0.001	Ba
PbO	0.26	223.20	0.007	Pb+2
Na2O	2.26	30.99	0.411	Na
K2O	0.00	47.10	0.000	K
Cs2O	0.00	140.90	0.000	Cs
F	1.71	19.00	0.507	F
H2O+	0.00	9.01	0.000	OH
H2O-	0.00	18.02	0.000	H2O
TOTAL	96.87		6.699	O
LESS O=F	0.72			
TOTAL	96.15			

A	B	O	(O	OH	F	) . 0.00 H2O
1.92	2.0	6.00	0.70	0.00	0.51	

(O + OH + F) = 1.21 Vacancies: 0.08 A -.21 Y
Dose (alphas/mg) = 0.281E+18 DPA (displacements/atom) = 36.3

microlite Age = 0.130E+10 years

Cation abundances (decreasing order):

A = Ca ,Na ,U+6 ,Fe+2,Mn+2,Pb+2,Sb+3,Y ,Ce ,Ba ,K ,Nd
Mean A valence = 2.07

B = Ta ,Nb ,Ti ,W ,Sn ,Zr ,Fe+3
Mean B valence = 4.96

P07.1

OXIDE	WT %	MOL WT	ATOMS	
WO3	0.12	231.80	0.003	W
Ta2O5	65.30	220.90	1.635	Ta
Nb2O5	7.33	132.90	0.305	Nb
TiO2	0.81	79.90	0.056	Ti
ZrO2	0.00	123.20	0.000	Zr
SnO2	0.03	150.70	0.001	Sn
Fe2O3	0.00	159.70	0.000	Fe+3
ThO2	0.00	264.00	0.000	Th
UO2	0.00	270.00	0.000	U+4
UO3	6.63	286.00	0.128	U+6
U3O8	0.00	842.00	0.000	U+8
Y2O3	0.07	112.90	0.003	Y
La2O3	0.00	162.90	0.000	La
Ce2O3	0.27	164.10	0.009	Ce
Pr2O3	0.00	164.90	0.000	Pr
Nd2O3	0.00	168.20	0.000	Nd
Sm2O3	0.00	174.40	0.000	Sm
Sb2O3	0.15	145.70	0.006	Sb+3
Bi2O3	0.00	233.00	0.000	Bi+3
MnO	0.45	70.94	0.035	Mn+2
FeO	0.64	71.85	0.049	Fe+2
CaO	12.50	56.08	1.233	Ca
SrO	0.00	103.60	0.000	Sr
BaO	0.04	153.30	0.001	Ba
PbO	0.21	223.20	0.005	Pb+2
Na2O	2.47	30.99	0.441	Na
K2O	0.00	47.10	0.000	K
Cs2O	0.00	140.90	0.000	Cs
F	1.57	19.00	0.457	F
H2O+	0.00	9.01	0.000	OH
H2O-	0.00	18.02	0.000	H2O
TOTAL	98.59		6.701	O
LESS O=F	0.66			
TOTAL	97.93			

A	B	O	(O	OH	F	) . 0.00 H2O
1.91	2.0	6.00	0.70	0.00	0.46	

(O + OH + F) = 1.16 Vacancies: 0.09 A -.16 Y
Dose (alphas/mg) = 0.271E+18 DPA (displacements/atom) = 35.3

microlite Age = 0.130E+10 years

Cation abundances (decreasing order):

A = Ca ,Na ,U+6 ,Fe+2,Mn+2,Ce ,Sb+3,Pb+2,Y ,Ba ,K ,La
Mean A valence = 2.05

B = Ta ,Nb ,Ti ,W ,Sn ,Zr ,Fe+3
Mean B valence = 4.97

P07.1

OXIDE	WT %	MOL WT	ATOMS	
WO3	0.13	231.80	0.003	W
Ta2O5	66.10	220.90	1.624	Ta
Nb2O5	7.54	132.90	0.308	Nb
TiO2	0.94	79.90	0.064	Ti
ZrO2	0.00	123.20	0.000	Zr
SnO2	0.02	150.70	0.001	Sn
Fe2O3	0.00	159.70	0.000	Fe+3
ThO2	0.05	264.00	0.001	Th
UO2	0.00	270.00	0.000	U+4
UO3	6.50	286.00	0.123	U+6
U3O8	0.00	842.00	0.000	U+8
Y2O3	0.11	112.90	0.005	Y
La2O3	0.00	162.90	0.000	La
Ce2O3	0.19	164.10	0.006	Ce
Pr2O3	0.00	164.90	0.000	Pr
Nd2O3	0.00	168.20	0.000	Nd
Sm2O3	0.00	174.40	0.000	Sm
Sb2O3	0.10	145.70	0.004	Sb+3
Bi2O3	0.00	233.00	0.000	Bi+3
MnO	0.41	70.94	0.031	Mn+2
FeO	0.46	71.85	0.035	Fe+2
CaO	11.60	56.08	1.123	Ca
SrO	0.00	103.60	0.000	Sr
BaO	0.03	153.30	0.001	Ba
PbO	0.22	223.20	0.005	Pb+2
Na2O	2.68	30.99	0.469	Na
K2O	0.00	47.10	0.000	K
Cs2O	0.00	140.90	0.000	Cs
F	1.42	19.00	0.406	F
H2O+	0.00	9.01	0.000	OH
H2O-	0.00	18.02	0.000	H2O
TOTAL	98.50		6.592	O
LESS O=F	0.60			
TOTAL	97.91			

A	B	O	(O	OH	F	) . 0.00 H2O
1.80	2.0	6.00	0.59	0.00	0.41	

(O + OH + F) = 1.00 Vacancies: 0.20 A 0.00 Y
Dose (alphas/mg) = 0.266E+18 DPA (displacements/atom) = 34.5

microlite Age = 0.130E+10 years

Cation abundances (decreasing order):

A = Ca ,Na ,U+6 ,Fe+2,Mn+2,Ce ,Pb+2,Y ,Sb+3,Ba ,Th ,K
Mean A valence = 2.02

B = Ta ,Nb ,Ti ,W ,Sn ,Zr ,Fe+3
Mean B valence = 4.97

P07.1

OXIDE	WT %	MOL WT	ATOMS	
WO3	0.31	231.80	0.008	W
Ta2O5	63.40	220.90	1.615	Ta
Nb2O5	7.13	132.90	0.302	Nb
TiO2	1.05	79.90	0.074	Ti
ZrO2	0.00	123.20	0.000	Zr
SnO2	0.04	150.70	0.001	Sn
Fe2O3	0.00	159.70	0.000	Fe+3
ThO2	0.00	264.00	0.000	Th
UO2	0.00	270.00	0.000	U+4
UO3	6.85	286.00	0.135	U+6
U3O8	0.00	842.00	0.000	U+8
Y2O3	0.09	112.90	0.004	Y
La2O3	0.00	162.90	0.000	La
Ce2O3	0.15	164.10	0.005	Ce
Pr2O3	0.00	164.90	0.000	Pr
Nd2O3	0.00	168.20	0.000	Nd
Sm2O3	0.00	174.40	0.000	Sm
Sb2O3	0.12	145.70	0.005	Sb+3
Bi2O3	0.00	233.00	0.000	Bi+3
MnO	0.48	70.94	0.038	Mn+2
FeO	0.83	71.85	0.065	Fe+2
CaO	12.40	56.08	1.244	Ca
SrO	0.00	103.60	0.000	Sr
BaO	0.01	153.30	0.000	Ba
PbO	0.21	223.20	0.005	Pb+2
Na2O	1.99	30.99	0.361	Na
K2O	0.00	47.10	0.000	K
Cs2O	0.00	140.90	0.000	Cs
F	1.56	19.00	0.462	F
H2O+	0.00	9.01	0.000	OH
H2O-	0.00	18.02	0.000	H2O
TOTAL	96.62		6.695	O
LESS O=F	0.66			
TOTAL	95.97			

A	B	O	(O	OH	F	) . 0.00 H2O
1.86	2.0	6.00	0.69	0.00	0.46	

(O + OH + F) = 1.16 Vacancies: 0.14 A -.16 Y
Dose (alphas/mg) = 0.286E+18 DPA (displacements/atom) = 37.3

microlite Age = 0.130E+10 years

Cation abundances (decreasing order):

A = Ca ,Na ,U+6 ,Fe+2,Mn+2,Pb+2,Ce ,Sb+3,Y ,Ba ,K ,Pr
Mean A valence = 2.10

B = Ta ,Nb ,Ti ,W ,Sn ,Zr ,Fe+3
Mean B valence = 4.97

Cleavelandite Unit (in Beryl Zone)

P01.1

OXIDE	WT %	MOL WT	ATOMS	
WO3	0.10	231.80	0.002	W
Ta2O5	71.20	220.90	1.724	Ta
Nb2O5	4.83	132.90	0.194	Nb
TiO2	1.18	79.90	0.079	Ti
ZrO2	0.00	123.20	0.000	Zr
SnO2	0.00	150.70	0.000	Sn
Fe2O3	0.00	159.70	0.000	Fe+3
ThO2	0.13	264.00	0.003	Th
UO2	0.00	270.00	0.000	U+4
UO3	3.45	286.00	0.065	U+6
U3O8	0.00	842.00	0.000	U+8
Y2O3	0.03	112.90	0.001	Y
La2O3	0.00	162.90	0.000	La
Ce2O3	0.22	164.10	0.007	Ce
Pr2O3	0.00	164.90	0.000	Pr
Nd2O3	0.00	168.20	0.000	Nd
Sm2O3	0.00	174.40	0.000	Sm
Sb2O3	0.20	145.70	0.007	Sb+3
Bi2O3	0.00	233.00	0.000	Bi+3
MnO	0.44	70.94	0.033	Mn+2
FeO	0.72	71.85	0.054	Fe+2
CaO	11.20	56.08	1.068	Ca
SrO	0.00	103.60	0.000	Sr
BaO	0.09	153.30	0.003	Ba
PbO	0.07	223.20	0.002	Pb+2
Na2O	3.26	30.99	0.563	Na
K2O	0.00	47.10	0.000	K
Cs2O	0.09	140.90	0.003	Cs
F	2.11	19.00	0.594	F
H2O+	0.00	9.01	0.000	OH
H2O-	0.00	18.02	0.000	H2O
TOTAL	99.32		6.331	O
LESS O=F	0.89			
TOTAL	98.44			

A	B	O	(O	OH	F	) . 0.00 H2O
1.81	2.0	6.00	0.33	0.00	0.59	

(O + OH + F) = 0.92 Vacancies: 0.19 A 0.08 Y
Dose (alphas/mg) = 0.141E+18 DPA (displacements/atom) = 17.7

microlite Age = 0.130E+10 years

Cation abundances (decreasing order):

A = Ca ,Na ,U+6 ,Fe+2,Mn+2,Sb+3,Ce ,Ba ,Th ,Pb+2,Y ,K
Mean A valence = 1.84

B = Ta ,Nb ,Ti ,W ,Sn ,Zr ,Fe+3
Mean B valence = 4.96

P01.1

OXIDE	WT %	MOL WT	ATOMS	
WO3	0.12	231.80	0.003	W
Ta2O5	71.90	220.90	1.718	Ta
Nb2O5	5.39	132.90	0.214	Nb
TiO2	0.96	79.90	0.063	Ti
ZrO2	0.00	123.20	0.000	Zr
SnO2	0.05	150.70	0.002	Sn
Fe2O3	0.00	159.70	0.000	Fe+3
ThO2	0.15	264.00	0.003	Th
UO2	0.00	270.00	0.000	U+4
UO3	3.41	286.00	0.063	U+6
U3O8	0.00	842.00	0.000	U+8
Y2O3	0.09	112.90	0.004	Y
La2O3	0.00	162.90	0.000	La
Ce2O3	0.18	164.10	0.006	Ce
Pr2O3	0.00	164.90	0.000	Pr
Nd2O3	0.00	168.20	0.000	Nd
Sm2O3	0.00	174.40	0.000	Sm
Sb2O3	0.12	145.70	0.004	Sb+3
Bi2O3	0.00	233.00	0.000	Bi+3
MnO	0.27	70.94	0.020	Mn+2
FeO	0.41	71.85	0.030	Fe+2
CaO	11.50	56.08	1.082	Ca
SrO	0.00	103.60	0.000	Sr
BaO	0.06	153.30	0.002	Ba
PbO	0.08	223.20	0.002	Pb+2
Na2O	3.28	30.99	0.559	Na
K2O	0.00	47.10	0.000	K
Cs2O	0.11	140.90	0.004	Cs
F	1.91	19.00	0.531	F
H2O+	0.00	9.01	0.000	OH
H2O-	0.00	18.02	0.000	H2O
TOTAL	99.99		6.338	O
LESS O=F	0.80			
TOTAL	99.19			

A	B	O	(O	OH	F	) . 0.00 H2O
1.78	2.0	6.00	0.34	0.00	0.53	

(O + OH + F) = 0.87 Vacancies: 0.22 A 0.13 Y
Dose (alphas/mg) = 0.138E+18 DPA (displacements/atom) = 17.4

microlite Age = 0.130E+10 years

Cation abundances (decreasing order):

A = Ca ,Na ,U+6 ,Fe+2,Mn+2,Ce ,Sb+3,Y ,Th ,Ba ,Pb+2,K
Mean A valence = 1.84

B = Ta ,Nb ,Ti ,W ,Sn ,Zr ,Fe+3
Mean B valence = 4.97

P01.1

OXIDE	WT %	MOL WT	ATOMS	
WO3	0.15	231.80	0.003	W
Ta2O5	71.00	220.90	1.721	Ta
Nb2O5	5.17	132.90	0.208	Nb
TiO2	0.99	79.90	0.066	Ti
ZrO2	0.00	123.20	0.000	Zr
SnO2	0.04	150.70	0.001	Sn
Fe2O3	0.00	159.70	0.000	Fe+3
ThO2	0.19	264.00	0.004	Th
UO2	0.00	270.00	0.000	U+4
UO3	3.55	286.00	0.066	U+6
U3O8	0.00	842.00	0.000	U+8
Y2O3	0.07	112.90	0.003	Y
La2O3	0.00	162.90	0.000	La
Ce2O3	0.17	164.10	0.006	Ce
Pr2O3	0.00	164.90	0.000	Pr
Nd2O3	0.00	168.20	0.000	Nd
Sm2O3	0.00	174.40	0.000	Sm
Sb2O3	0.11	145.70	0.004	Sb+3
Bi2O3	0.00	233.00	0.000	Bi+3
MnO	0.26	70.94	0.020	Mn+2
FeO	0.38	71.85	0.028	Fe+2
CaO	11.60	56.08	1.107	Ca
SrO	0.00	103.60	0.000	Sr
BaO	0.04	153.30	0.001	Ba
PbO	0.07	223.20	0.002	Pb+2
Na2O	3.02	30.99	0.522	Na
K2O	0.00	47.10	0.000	K
Cs2O	0.11	140.90	0.004	Cs
F	1.95	19.00	0.549	F
H2O+	0.00	9.01	0.000	OH
H2O-	0.00	18.02	0.000	H2O
TOTAL	98.87		6.341	O
LESS O=F	0.82			
TOTAL	98.05			

A	B	O	(O	OH	F	) . 0.00 H2O
1.77	2.0	6.00	0.34	0.00	0.55	

(O + OH + F) = 0.89 Vacancies: 0.23 A 0.11 Y
Dose (alphas/mg) = 0.145E+18 DPA (displacements/atom) = 18.4

microlite Age = 0.130E+10 years

Cation abundances (decreasing order):

A = Ca ,Na ,U+6 ,Fe+2,Mn+2,Ce ,Sb+3,Th ,Y ,Pb+2,Ba ,K
Mean A valence = 1.86

B = Ta ,Nb ,Ti ,W ,Sn ,Zr ,Fe+3
Mean B valence = 4.97

P01.1

OXIDE	WT %	MOL WT	ATOMS	
WO3	0.09	231.80	0.002	W
Ta2O5	71.10	220.90	1.721	Ta
Nb2O5	5.10	132.90	0.205	Nb
TiO2	1.06	79.90	0.071	Ti
ZrO2	0.00	123.20	0.000	Zr
SnO2	0.02	150.70	0.001	Sn
Fe2O3	0.00	159.70	0.000	Fe+3
ThO2	0.29	264.00	0.006	Th
UO2	0.00	270.00	0.000	U+4
UO3	3.68	286.00	0.069	U+6
U3O8	0.00	842.00	0.000	U+8
Y2O3	0.09	112.90	0.004	Y
La2O3	0.00	162.90	0.000	La
Ce2O3	0.15	164.10	0.005	Ce
Pr2O3	0.00	164.90	0.000	Pr
Nd2O3	0.00	168.20	0.000	Nd
Sm2O3	0.00	174.40	0.000	Sm
Sb2O3	0.17	145.70	0.006	Sb+3
Bi2O3	0.00	233.00	0.000	Bi+3
MnO	0.22	70.94	0.017	Mn+2
FeO	0.35	71.85	0.026	Fe+2
CaO	11.60	56.08	1.106	Ca
SrO	0.00	103.60	0.000	Sr
BaO	0.02	153.30	0.001	Ba
PbO	0.09	223.20	0.002	Pb+2
Na2O	3.17	30.99	0.547	Na
K2O	0.00	47.10	0.000	K
Cs2O	0.11	140.90	0.004	Cs
F	1.96	19.00	0.552	F
H2O+	0.00	9.01	0.000	OH
H2O-	0.00	18.02	0.000	H2O
TOTAL	99.27		6.358	O
LESS O=F	0.82			
TOTAL	98.44			

A	B	O	(O	OH	F	) . 0.00 H2O
1.79	2.0	6.00	0.36	0.00	0.55	

(O + OH + F) = 0.91 Vacancies: 0.21 A 0.09 Y
Dose (alphas/mg) = 0.150E+18 DPA (displacements/atom) = 19.0

microlite Age = 0.130E+10 years

Cation abundances (decreasing order):

A = Ca ,Na ,U+6 ,Fe+2,Mn+2,Sb+3,Th ,Ce ,Y ,Pb+2,Ba ,K
Mean A valence = 1.86

B = Ta ,Nb ,Ti ,W ,Sn ,Zr ,Fe+3
Mean B valence = 4.97

P01.1

OXIDE	WT %	MOL WT	ATOMS	
WO3	0.03	231.80	0.001	W
Ta2O5	71.70	220.90	1.718	Ta
Nb2O5	5.30	132.90	0.211	Nb
TiO2	1.04	79.90	0.069	Ti
ZrO2	0.00	123.20	0.000	Zr
SnO2	0.04	150.70	0.001	Sn
Fe2O3	0.00	159.70	0.000	Fe+3
ThO2	0.16	264.00	0.003	Th
UO2	0.00	270.00	0.000	U+4
UO3	3.76	286.00	0.070	U+6
U3O8	0.00	842.00	0.000	U+8
Y2O3	0.07	112.90	0.003	Y
La2O3	0.00	162.90	0.000	La
Ce2O3	0.17	164.10	0.005	Ce
Pr2O3	0.00	164.90	0.000	Pr
Nd2O3	0.00	168.20	0.000	Nd
Sm2O3	0.00	174.40	0.000	Sm
Sb2O3	0.18	145.70	0.007	Sb+3
Bi2O3	0.00	233.00	0.000	Bi+3
MnO	0.14	70.94	0.010	Mn+2
FeO	0.39	71.85	0.029	Fe+2
CaO	10.70	56.08	1.010	Ca
SrO	0.00	103.60	0.000	Sr
BaO	0.02	153.30	0.001	Ba
PbO	0.09	223.20	0.002	Pb+2
Na2O	4.28	30.99	0.731	Na
K2O	0.00	47.10	0.000	K
Cs2O	0.10	140.90	0.004	Cs
F	2.36	19.00	0.657	F
H2O+	0.00	9.01	0.000	OH
H2O-	0.00	18.02	0.000	H2O
TOTAL	100.53		6.294	O
LESS O=F	0.99			
TOTAL	99.54			

A	B	O	(O	OH	F	) . 0.00 H2O
1.87	2.0	6.00	0.29	0.00	0.66	

(O + OH + F) = 0.95 Vacancies: 0.13 A 0.05 Y
Dose (alphas/mg) = 0.151E+18 DPA (displacements/atom) = 18.9

microlite Age = 0.130E+10 years

Cation abundances (decreasing order):

A = Ca ,Na ,U+6 ,Fe+2,Mn+2,Sb+3,Ce ,Y ,Th ,Pb+2,Ba ,K
Mean A valence = 1.77

B = Ta ,Nb ,Ti ,Sn ,W ,Zr ,Fe+3
Mean B valence = 4.97

P01.1

OXIDE	WT %	MOL WT	ATOMS	
WO3	0.08	231.80	0.002	W
Ta2O5	72.10	220.90	1.728	Ta
Nb2O5	4.74	132.90	0.189	Nb
TiO2	1.20	79.90	0.080	Ti
ZrO2	0.00	123.20	0.000	Zr
SnO2	0.06	150.70	0.002	Sn
Fe2O3	0.00	159.70	0.000	Fe+3
ThO2	0.17	264.00	0.003	Th
UO2	0.00	270.00	0.000	U+4
UO3	3.45	286.00	0.064	U+6
U3O8	0.00	842.00	0.000	U+8
Y2O3	0.09	112.90	0.004	Y
La2O3	0.00	162.90	0.000	La
Ce2O3	0.13	164.10	0.004	Ce
Pr2O3	0.00	164.90	0.000	Pr
Nd2O3	0.00	168.20	0.000	Nd
Sm2O3	0.00	174.40	0.000	Sm
Sb2O3	0.13	145.70	0.005	Sb+3
Bi2O3	0.00	233.00	0.000	Bi+3
MnO	0.27	70.94	0.020	Mn+2
FeO	0.44	71.85	0.032	Fe+2
CaO	11.30	56.08	1.067	Ca
SrO	0.00	103.60	0.000	Sr
BaO	0.04	153.30	0.001	Ba
PbO	0.09	223.20	0.002	Pb+2
Na2O	3.57	30.99	0.610	Na
K2O	0.00	47.10	0.000	K
Cs2O	0.12	140.90	0.005	Cs
F	2.15	19.00	0.599	F
H2O+	0.00	9.01	0.000	OH
H2O-	0.00	18.02	0.000	H2O
TOTAL	100.13		6.309	O
LESS O=F	0.90			
TOTAL	99.23			

A	B	O	(O	OH	F	) . 0.00 H2O
1.82	2.0	6.00	0.31	0.00	0.60	

(O + OH + F) = 0.91 Vacancies: 0.18 A 0.09 Y
Dose (alphas/mg) = 0.139E+18 DPA (displacements/atom) = 17.5

microlite Age = 0.130E+10 years

Cation abundances (decreasing order):

A = Ca ,Na ,U+6 ,Fe+2,Mn+2,Sb+3,Y ,Ce ,Th ,Pb+2,Ba ,K
Mean A valence = 1.81

B = Ta ,Nb ,Ti ,Sn ,W ,Zr ,Fe+3
Mean B valence = 4.96

P01.1

OXIDE	WT %	MOL WT	ATOMS	
WO3	0.15	231.80	0.003	W
Ta2O5	72.10	220.90	1.729	Ta
Nb2O5	4.53	132.90	0.181	Nb
TiO2	1.30	79.90	0.086	Ti
ZrO2	0.00	123.20	0.000	Zr
SnO2	0.03	150.70	0.001	Sn
Fe2O3	0.00	159.70	0.000	Fe+3
ThO2	0.16	264.00	0.003	Th
UO2	0.00	270.00	0.000	U+4
UO3	3.93	286.00	0.073	U+6
U3O8	0.00	842.00	0.000	U+8
Y2O3	0.09	112.90	0.004	Y
La2O3	0.00	162.90	0.000	La
Ce2O3	0.16	164.10	0.005	Ce
Pr2O3	0.00	164.90	0.000	Pr
Nd2O3	0.00	168.20	0.000	Nd
Sm2O3	0.00	174.40	0.000	Sm
Sb2O3	0.12	145.70	0.004	Sb+3
Bi2O3	0.00	233.00	0.000	Bi+3
MnO	0.17	70.94	0.013	Mn+2
FeO	0.30	71.85	0.022	Fe+2
CaO	10.90	56.08	1.029	Ca
SrO	0.00	103.60	0.000	Sr
BaO	0.07	153.30	0.002	Ba
PbO	0.10	223.20	0.002	Pb+2
Na2O	3.83	30.99	0.655	Na
K2O	0.00	47.10	0.000	K
Cs2O	0.10	140.90	0.004	Cs
F	2.05	19.00	0.571	F
H2O+	0.00	9.01	0.000	OH
H2O-	0.00	18.02	0.000	H2O
TOTAL	100.09		6.316	O
LESS O=F	0.86			
TOTAL	99.23			

A	B	O	(O	OH	F	) . 0.00 H2O
1.82	2.0	6.00	0.32	0.00	0.57	

(O + OH + F) = 0.89 Vacancies: 0.18 A 0.11 Y
Dose (alphas/mg) = 0.159E+18 DPA (displacements/atom) = 20.0

microlite Age = 0.130E+10 years

Cation abundances (decreasing order):

A = Ca ,Na ,U+6 ,Fe+2,Mn+2,Ce ,Sb+3,Y ,Th ,Ba ,Pb+2,K
Mean A valence = 1.81

B = Ta ,Nb ,Ti ,W ,Sn ,Zr ,Fe+3
Mean B valence = 4.96

P05.1

OXIDE	WT %	MOL WT	ATOMS	
WO3	0.37	231.80	0.009	W
Ta2O5	78.00	220.90	1.882	Ta
Nb2O5	2.55	132.90	0.102	Nb
TiO2	0.09	79.90	0.006	Ti
ZrO2	0.00	123.20	0.000	Zr
SnO2	0.03	150.70	0.001	Sn
Fe2O3	0.00	159.70	0.000	Fe+3
ThO2	0.00	264.00	0.000	Th
UO2	0.00	270.00	0.000	U+4
UO3	1.12	286.00	0.021	U+6
U3O8	0.00	842.00	0.000	U+8
Y2O3	0.07	112.90	0.003	Y
La2O3	0.00	162.90	0.000	La
Ce2O3	0.25	164.10	0.008	Ce
Pr2O3	0.00	164.90	0.000	Pr
Nd2O3	0.00	168.20	0.000	Nd
Sm2O3	0.00	174.40	0.000	Sm
Sb2O3	0.21	145.70	0.008	Sb+3
Bi2O3	0.00	233.00	0.000	Bi+3
MnO	0.05	70.94	0.004	Mn+2
FeO	0.09	71.85	0.007	Fe+2
CaO	10.40	56.08	0.989	Ca
SrO	0.00	103.60	0.000	Sr
BaO	0.09	153.30	0.003	Ba
PbO	0.22	223.20	0.005	Pb+2
Na2O	4.37	30.99	0.752	Na
K2O	0.00	47.10	0.000	K
Cs2O	0.00	140.90	0.000	Cs
F	2.57	19.00	0.721	F
H2O+	0.00	9.01	0.000	OH
H2O-	0.00	18.02	0.000	H2O
TOTAL	100.48		6.115	O
LESS O=F	1.08			
TOTAL	99.40			

A	B	O	(O	OH	F	) . 0.00 H2O
1.80	2.0	6.00	0.11	0.00	0.72	

(O + OH + F) = 0.84 Vacancies: 0.20 A 0.16 Y

Dose (alphas/mg) = 0.453E+17 DPA (displacements/atom) = 5.7

microlite Age = 0.130E+10 years

Cation abundances (decreasing order):

A = Ca ,Na ,U+6 ,Ce ,Sb+3,Fe+2,Pb+2,Mn+2,Y ,Ba ,K ,Nd
Mean A valence = 1.64

B = Ta ,Nb ,W ,Ti ,Sn ,Zr ,Fe+3
Mean B valence = 5.00

P05.1

OXIDE	WT %	MOL WT	ATOMS	
WO3	0.25	231.80	0.006	W
Ta2O5	74.50	220.90	1.752	Ta
Nb2O5	5.85	132.90	0.229	Nb
TiO2	0.18	79.90	0.012	Ti
ZrO2	0.00	123.20	0.000	Zr
SnO2	0.05	150.70	0.002	Sn
Fe2O3	0.00	159.70	0.000	Fe+3
ThO2	0.06	264.00	0.001	Th
UO2	0.00	270.00	0.000	U+4
UO3	0.60	286.00	0.011	U+6
U3O8	0.00	842.00	0.000	U+8
Y2O3	0.11	112.90	0.005	Y
La2O3	0.00	162.90	0.000	La
Ce2O3	0.21	164.10	0.007	Ce
Pr2O3	0.00	164.90	0.000	Pr
Nd2O3	0.00	168.20	0.000	Nd
Sm2O3	0.00	174.40	0.000	Sm
Sb2O3	0.19	145.70	0.007	Sb+3
Bi2O3	0.00	233.00	0.000	Bi+3
MnO	0.05	70.94	0.004	Mn+2
FeO	0.08	71.85	0.006	Fe+2
CaO	11.30	56.08	1.047	Ca
SrO	0.00	103.60	0.000	Sr
BaO	0.00	153.30	0.000	Ba
PbO	0.10	223.20	0.002	Pb+2
Na2O	4.59	30.99	0.770	Na
K2O	0.00	47.10	0.000	K
Cs2O	0.00	140.90	0.000	Cs
F	3.07	19.00	0.840	F
H2O+	0.00	9.01	0.000	OH
H2O-	0.00	18.02	0.000	H2O
TOTAL	101.19		6.083	O
LESS O=F	1.29			
TOTAL	99.90			

A	B	O	(O	OH	F	) . 0.00 H2O
1.86	2.0	6.00	0.08	0.00	0.84	

(O + OH + F) = 0.92 Vacancies: 0.14 A 0.08 Y

Dose (alphas/mg) = 0.242E+17 DPA (displacements/atom) = 2.9

microlite Age = 0.130E+10 years

Cation abundances (decreasing order):

A = Ca ,Na ,U+6 ,Sb+3,Ce ,Fe+2,Y ,Mn+2,Pb+2,Th ,K ,U+8
Mean A valence = 1.62

B = Ta ,Nb ,Ti ,W ,Sn ,Zr ,Fe+3
Mean B valence = 5.00

P05.1

OXIDE	WT %	MOL WT	ATOMS	
WO3	0.35	231.80	0.008	W
Ta2O5	74.60	220.90	1.759	Ta
Nb2O5	5.71	132.90	0.224	Nb
TiO2	0.11	79.90	0.007	Ti
ZrO2	0.00	123.20	0.000	Zr
SnO2	0.06	150.70	0.002	Sn
Fe2O3	0.00	159.70	0.000	Fe+3
ThO2	0.00	264.00	0.000	Th
UO2	0.00	270.00	0.000	U+4
UO3	0.55	286.00	0.010	U+6
U3O8	0.00	842.00	0.000	U+8
Y2O3	0.10	112.90	0.005	Y
La2O3	0.00	162.90	0.000	La
Ce2O3	0.26	164.10	0.008	Ce
Pr2O3	0.00	164.90	0.000	Pr
Nd2O3	0.00	168.20	0.000	Nd
Sm2O3	0.00	174.40	0.000	Sm
Sb2O3	0.17	145.70	0.006	Sb+3
Bi2O3	0.00	233.00	0.000	Bi+3
MnO	0.00	70.94	0.000	Mn+2
FeO	0.09	71.85	0.007	Fe+2
CaO	11.40	56.08	1.059	Ca
SrO	0.00	103.60	0.000	Sr
BaO	0.03	153.30	0.001	Ba
PbO	0.18	223.20	0.004	Pb+2
Na2O	4.58	30.99	0.770	Na
K2O	0.00	47.10	0.000	K
Cs2O	0.01	140.90	0.000	Cs
F	3.17	19.00	0.869	F
H2O+	0.00	9.01	0.000	OH
H2O-	0.00	18.02	0.000	H2O
TOTAL	101.37		6.079	O
LESS O=F	1.33			
TOTAL	100.04			

A	B	O	(O	OH	F	) . 0.00 H2O
1.87	2.0	6.00	0.08	0.00	0.87	

(O + OH + F) = 0.95 Vacancies: 0.13 A 0.05 Y
Dose (alphas/mg) = 0.221E+17 DPA (displacements/atom) = 2.7

microlite Age = 0.130E+10 years

Cation abundances (decreasing order):

A = Ca ,Na ,U+6 ,Ce ,Fe+2,Sb+3,Y ,Pb+2,Ba ,K ,Sm ,La
Mean A valence = 1.62

B = Ta ,Nb ,W ,Ti ,Sn ,Zr ,Fe+3
Mean B valence = 5.00

P05.1

OXIDE	WT %	MOL WT	ATOMS	
WO3	0.39	231.80	0.009	W
Ta2O5	75.20	220.90	1.749	Ta
Nb2O5	6.22	132.90	0.240	Nb
TiO2	0.01	79.90	0.001	Ti
ZrO2	0.00	123.20	0.000	Zr
SnO2	0.04	150.70	0.001	Sn
Fe2O3	0.00	159.70	0.000	Fe+3
ThO2	0.13	264.00	0.003	Th
UO2	0.00	270.00	0.000	U+4
UO3	0.64	286.00	0.011	U+6
U3O8	0.00	842.00	0.000	U+8
Y2O3	0.09	112.90	0.004	Y
La2O3	0.00	162.90	0.000	La
Ce2O3	0.21	164.10	0.007	Ce
Pr2O3	0.00	164.90	0.000	Pr
Nd2O3	0.00	168.20	0.000	Nd
Sm2O3	0.00	174.40	0.000	Sm
Sb2O3	0.19	145.70	0.007	Sb+3
Bi2O3	0.00	233.00	0.000	Bi+3
MnO	0.07	70.94	0.005	Mn+2
FeO	0.11	71.85	0.008	Fe+2
CaO	11.20	56.08	1.026	Ca
SrO	0.00	103.60	0.000	Sr
BaO	0.02	153.30	0.001	Ba
PbO	0.17	223.20	0.004	Pb+2
Na2O	4.54	30.99	0.753	Na
K2O	0.00	47.10	0.000	K
Cs2O	0.00	140.90	0.000	Cs
F	3.01	19.00	0.814	F
H2O+	0.00	9.01	0.000	OH
H2O-	0.00	18.02	0.000	H2O
TOTAL	102.24		6.082	O
LESS O=F	1.26			
TOTAL	100.97			

A	B	O	(O	OH	F	) . 0.00 H2O
1.83	2.0	6.00	0.08	0.00	0.81	

(O + OH + F) = 0.90 Vacancies: 0.17 A 0.10 Y
Dose (alphas/mg) = 0.252E+17 DPA (displacements/atom) = 3.1

microlite Age = 0.130E+10 years

Cation abundances (decreasing order):

A = Ca ,Na ,U+6 ,Fe+2,Sb+3,Ce ,Mn+2,Y ,Pb+2,Th ,Ba ,K
Mean A valence = 1.63

B = Ta ,Nb ,W ,Sn ,Ti ,Zr ,Fe+3
Mean B valence = 5.00

P05.1

OXIDE	WT %	MOL WT	ATOMS	
WO3	0.29	231.80	0.007	W
Ta2O5	74.20	220.90	1.755	Ta
Nb2O5	5.94	132.90	0.234	Nb
TiO2	0.05	79.90	0.003	Ti
ZrO2	0.00	123.20	0.000	Zr
SnO2	0.04	150.70	0.001	Sn
Fe2O3	0.00	159.70	0.000	Fe+3
ThO2	0.08	264.00	0.002	Th
UO2	0.00	270.00	0.000	U+4
UO3	1.66	286.00	0.030	U+6
U3O8	0.00	842.00	0.000	U+8
Y2O3	0.09	112.90	0.004	Y
La2O3	0.00	162.90	0.000	La
Ce2O3	0.24	164.10	0.008	Ce
Pr2O3	0.00	164.90	0.000	Pr
Nd2O3	0.00	168.20	0.000	Nd
Sm2O3	0.00	174.40	0.000	Sm
Sb2O3	0.19	145.70	0.007	Sb+3
Bi2O3	0.00	233.00	0.000	Bi+3
MnO	0.03	70.94	0.002	Mn+2
FeO	0.10	71.85	0.007	Fe+2
CaO	11.10	56.08	1.034	Ca
SrO	0.00	103.60	0.000	Sr
BaO	0.04	153.30	0.001	Ba
PbO	0.18	223.20	0.004	Pb+2
Na2O	4.34	30.99	0.732	Na
K2O	0.00	47.10	0.000	K
Cs2O	0.00	140.90	0.000	Cs
F	2.57	19.00	0.707	F
H2O+	0.00	9.01	0.000	OH
H2O-	0.00	18.02	0.000	H2O
TOTAL	101.14		6.185	O
LESS O=F	1.08			
TOTAL	100.06			

A	B	O	(O	OH	F	) . 0.00 H2O
1.83	2.0	6.00	0.19	0.00	0.71	

(O + OH + F) = 0.89 Vacancies: 0.17 A 0.11 Y
Dose (alphas/mg) = 0.666E+17 DPA (displacements/atom) = 8.2

microlite Age = 0.130E+10 years

Cation abundances (decreasing order):

A = Ca ,Na ,U+6 ,Ce ,Fe+2,Sb+3,Pb+2,Y ,Mn+2,Th ,Ba ,K
Mean A valence = 1.68

B = Ta ,Nb ,W ,Ti ,Sn ,Zr ,Fe+3
Mean B valence = 5.00

P05.1

OXIDE	WT %	MOL WT	ATOMS	
WO3	0.15	231.80	0.003	W
Ta2O5	60.60	220.90	1.430	Ta
Nb2O5	10.40	132.90	0.408	Nb
TiO2	2.41	79.90	0.157	Ti
ZrO2	0.00	123.20	0.000	Zr
SnO2	0.04	150.70	0.001	Sn
Fe2O3	0.00	159.70	0.000	Fe+3
ThO2	0.05	264.00	0.001	Th
UO2	0.00	270.00	0.000	U+4
UO3	5.97	286.00	0.109	U+6
U3O8	0.00	842.00	0.000	U+8
Y2O3	0.10	112.90	0.005	Y
La2O3	0.00	162.90	0.000	La
Ce2O3	0.18	164.10	0.006	Ce
Pr2O3	0.00	164.90	0.000	Pr
Nd2O3	0.00	168.20	0.000	Nd
Sm2O3	0.00	174.40	0.000	Sm
Sb2O3	0.42	145.70	0.015	Sb+3
Bi2O3	0.00	233.00	0.000	Bi+3
MnO	0.44	70.94	0.032	Mn+2
FeO	0.22	71.85	0.016	Fe+2
CaO	11.90	56.08	1.106	Ca
SrO	0.00	103.60	0.000	Sr
BaO	0.01	153.30	0.000	Ba
PbO	0.78	223.20	0.018	Pb+2
Na2O	3.15	30.99	0.530	Na
K2O	0.00	47.10	0.000	K
Cs2O	0.00	140.90	0.000	Cs
F	1.76	19.00	0.483	F
H2O+	0.00	9.01	0.000	OH
H2O-	0.00	18.02	0.000	H2O
TOTAL	98.58		6.486	O
LESS O=F	0.74			
TOTAL	97.85			

A	B	O	(O	OH	F	) . 0.00 H2O
1.84	2.0	6.00	0.49	0.00	0.48	

(O + OH + F) = 0.97 Vacancies: 0.16 A 0.03 Y

Dose (alphas/mg) = 0.245E+18 DPA (displacements/atom) = 30.1

microlite Age = 0.130E+10 years

Cation abundances (decreasing order):

A = Ca ,Na ,U+6 ,Mn+2,Pb+2,Fe+2,Sb+3,Ce ,Y ,Th ,Ba ,K
Mean A valence = 1.96

B = Ta ,Nb ,Ti ,W ,Sn ,Zr ,Fe+3
Mean B valence = 4.92