

Overview of NUCLEA-15

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1 General Description

1.1 Atoms

18 + 2 atoms

U, O, Zr	fuel element
Ag, In, B, C	control rod
Fe, Cr, Ni	vessel and internal structure
Si, Mg, Al, Ca	concrete
Ba, La, Ru, Sr	fission products
Ar, H	gas

1.2 Stoichiometric Condensed Phases

LatSubSol name	TDB name
AG1BA1 (S)	AG1BA1
AG2BA1 (S)	AG2BA1
AG2BA3 (S)	AG2BA3
AG5BA1 (S)	AG5BA1
AG1CA1 (S)	AG1CA1
AG1CA3 (S)	AG1CA3
AG2CA1 (S)	AG2CA1
AG3CA5 (S)	AG3CA5
AG7CA2 (S)	AG7CA2
AG9CA2 (S)	AG9CA2
AG1IN2 (S)	AG1IN2
AG2IN1 (S)	AG2IN1
AG3IN1 (S)	AG3IN1
AG1LA1 (S)	AG1LA1
AG2LA1 (S)	AG2LA1
AG46LA14 (S)	AG46LA14
AG5LA1 (S)	AG5LA1
AG1MG3 (S)	AG1MG3
AG3MG1 (S)	AG3MG1
AG2O1 (S)	AG2O1
AG1SR1 (S)	AG1SR1
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LatSubSol name	TDB name
AG2SR1 (S)	AG2SR1
AG2SR3 (S)	AG2SR3
AG4SR1 (S)	AG4SR1
AG5SR1 (S)	AG5SR1
AG1ZR1 (S)	AG1ZR1
AG1ZR2 (S)	AG1ZR2
AL1B10 (S)	AL1B10
AL1B12 (S)	AL1B12
AL1B2 (S)	AL1B2
AL4B209 (S)	AL4B209
AL13BA7 (S)	AL13BA7
AL4BA1 (S)	AL4BA1
AL5BA4 (S)	AL5BA4
AL12BA1019 (S)	AL12BA1019
AL2BA104 (S)	AL2BA104
AL2BA306 (S)	AL2BA306
AL4C3 (S)	AL4C3
AL4C4SI1 (S)	AL4C4SI1
AL8C7SI1 (S)	AL8C7SI1
AL1CA1 (S)	AL1CA1
AL2CA1 (S)	AL2CA1
AL3CA8 (S)	AL3CA8
AL4CA1 (S)	AL4CA1
AL14CA12033 (S)	AL14CA12033
AL2CA108SI2 (ANORTHITE)	AL2CA108SI2
AL2CA207SI1 (MELILITE)	AL2CA207SI1
AL2CA1SI2 (S)	AL2CA1SI2
AL1CR2 (S)	AL1CR2
AL4CR1 (S)	AL4CR1
AL13CR2 (S)	AL13CR2
AL8CR5 (S)	AL8CR5
AL9CR4 (S)	AL9CR4
AL2FE1 (S)	AL2FE1
AL3FE1 (S)	AL3FE1
AL3FE2 (S)	AL3FE2
AL5FE2 (S)	AL5FE2
AL1FE103 (S)	AL1FE103
AL1LA1 (S)	AL1LA1
AL11LA3 (S)	AL11LA3
AL1LA3 (S)	AL1LA3
AL2LA1 (S)	AL2LA1
AL24LA10 (S)	AL24LA10
AL3LA1 (S)	AL3LA1
AL11LA1018 (S)	AL11LA1018
AL1LA103 (S)	AL1LA103
AL525MG475 (S)	AL525MG475
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LatSubSol name	TDB name
AL56MG44 (S)	AL56MG44
AL8MG5 (S)	AL8MG5
AL1NI3 (S)	AL1NI3
AL3NI1 (S)	AL3NI1
AL3NI2 (S)	AL3NI2
AL2O4SR1 (H_T)	AL2O4SR1_1
AL2O4SR1 (L_T)	AL2O4SR1_2
AL12O19SR1 (S)	AL12O19SR1
AL2O6SR3 (S)	AL2O6SR3
AL32O132SR84 (S)	AL32O132SR84
AL4O7SR1 (S)	AL4O7SR1
AL1RU1 (S)	AL1RU1
AL13RU4 (S)	AL13RU4
AL2RU1 (S)	AL2RU1
AL3RU2 (S)	AL3RU2
AL6RU1 (S)	AL6RU1
AL1SR1 (S)	AL1SR1
AL2SR1 (S)	AL2SR1
AL4SR1 (S)	AL4SR1
AL2U1 (S)	AL2U1
AL3U1 (S)	AL3U1
AL4U0.9 (S)	AL4U09
AL3ZR1 (S)	AL075ZR025
AL2ZR1 (S)	AL06667ZR03333
AL3ZR2 (S)	AL06ZR04
AL1ZR1 (S)	AL05ZR05
AL4ZR5 (S)	AL04445ZR05555
AL2ZR3 (S)	AL04ZR06
AL3ZR5 (S)	AL0375ZR0625
AL1ZR2 (S)	AL03333ZR06667
AL1ZR3 (S)	AL025ZR075
AL3ZR4 (S)	AL042857ZR057143
B6BA1 (S)	B6BA1
B2BA104 (S)	B2BA104
B2BA306 (S)	B2BA306
B4BA107 (S)	B4BA107
B8BA1013 (S)	B8BA1013
B1C1U1 (S)	B1C1U1
B2C1U1 (S)	B2C1U1
B2C7U5 (S)	B2C7U5
B2CA104 (S)	B2CA104
B2CA205 (S)	B2CA205
B2CA306 (S)	B2CA306
B4CA107 (S)	B4CA107
B2CA108SI2 (S)	B2CA108SI2
B2CA5010SI1 (S)	B2CA5010SI1
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LatSubSol name	TDB name
B1CR1 (S)	B1CR1
B1CR2 (S)	B1CR2
B2CR1 (S)	B2CR1
B3CR5 (S)	B3CR5
B4CR1 (S)	B4CR1
B4CR3 (S)	B4CR3
B1FE1 (S)	B1FE1
B1FE2 (S)	B1FE2
B1FE103 (S)	B1FE103
B1FE306 (S)	B1FE306
B2FE104 (S)	B2FE104
B2FE205 (S)	B2FE205
B2FE306 (S)	B2FE306
B2FE3U1 (S)	B2FE3U1
B4FE1U1 (S)	B4FE1U1
B2IN206 (S)	B2IN206
B4LA1 (S)	B4LA1
B6LA1 (S)	B6LA1
B9LA1 (S)	B9LA1
B2LA206 (S)	B2LA206
B2LA6012 (S)	B2LA6012
B6LA2012 (S)	B6LA2012
B2MG1 (S)	B2MG1
B4MG1 (S)	B4MG1
B7MG1 (S)	B7MG1
B2MG205 (S)	B2MG205
B2MG306 (S)	B2MG306
B4MG107 (S)	B4MG107
B1NI1 (S)	B1NI1
B1NI2 (S)	B1NI2
B1NI3 (S)	B1NI3
B3NI4 (S)	B3NI4
B2NI205 (S)	B2NI205
B2NI306 (S)	B2NI306
B1O1.5 (S)	B1O15
B2O4SR1 (S)	B2O4SR1
B2O5SR2 (S)	B2O5SR2
B2O6SR3 (S)	B2O6SR3
B4O7SR1 (S)	B4O7SR1
B6O10SR1 (S)	B6O10SR1
B1RU1 (S)	B1RU1
B2RU1 (S)	B2RU1
B3RU2 (S)	B3RU2
B3RU7 (S)	B3RU7
B14SI1 (S)	B14SI1
B3SI1 (S)	B3SI1
B6SI1 (S)	B6SI1
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LatSubSol name	TDB name
B6SR1 (S)	B6SR1
B12U1 (S)	B12U1
B2U1 (S)	B2U1
B4U1 (S)	B4U1
B1ZR1 (S)	B1ZR1
B12ZR1 (S)	B12ZR1
B2ZR1 (S)	B2ZR1
B4ZR3 (S)	B4ZR3
BA1C2 (S)	BA1C2
BA1CR204 (S)	BA1CR204
BA3CR206 (S)	BA3CR206
BA1FE12019 (S)	BA1FE12019
BA1FE204 (S)	BA1FE204
BA2FE205 (S)	BA2FE205
BA2FE6011 (S)	BA2FE6011
BA7FE4013 (S)	BA7FE4013
BA1IN1 (S)	BA1IN1
BA1IN2 (S)	BA1IN2
BA13IN1 (S)	BA13IN1
BA1IN4 (S)	BA1IN4
BA5IN2 (S)	BA5IN2
BA5IN3 (S)	BA5IN3
BA1IN204 (S)	BA1IN204
BA2IN205 (S)	BA2IN205
BA3IN206 (S)	BA3IN206
BA4IN6013 (S)	BA4IN6013
BA5IN208 (S)	BA5IN208
BA1LA204 (S)	BA1LA204
BA1MG2 (S)	BA1MG2
BA2MG17 (S)	BA2MG17
BA6MG23 (S)	BA6MG23
BA1NI102 (S)	BA1NI102
BA3NI104 (S)	BA3NI104
BA103SI1 (S)	BA103SI1
BA105SI2 (S)	BA105SI2
BA204SI1 (S)	BA204SI1
BA208SI3 (S)	BA208SI3
BA3013SI5 (S)	BA3013SI5
BA5021SI8 (S)	BA5021SI8
BA1SI1 (S)	BA1SI1
BA1SI2 (S)	BA1SI2
C1 (GRA_HEX_A9)	C
C2CR3 (M3C2) (C-CR-FE-NI)	C2CR3
C2LA1 (LT)	C2LA1
C2RU1U2 (S)	C2RU1U2
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LatSubSol name	TDB name
C1SI1 (S)	C1SI1
C2SR1 (S)	C2SR1
C3U2 (S)	C3U2
CA1CR204 (HT)	CA1CR204_1
CA1CR204 (BT)	CA1CR204_2
CA1CR104 (S)	CA1CR104
CA2CR13020 (X)	CA2CR13020
CA3CR2012SI3 (UVAROVITE)	CA3CR2012SI3
CA5CR5050SI20 (GILLESPIE)	CA5CR5050SI20
CA1FE407 (S)	CA1FE407
CA1FE305 (S) (CWF)	CA1FE305
CA1FE507 (S) (CW3F)	CA1FE507
CA1FE106SI2 (hedenbergite)	CA1FE106SI2
CA1IN1 (S)	CA1IN1
CA1IN2 (S)	CA1IN2
CA3IN1 (S)	CA3IN1
CA1MG2 (S)	CA1MG2
CA1NI2 (S)	CA1NI2
CA1NI3 (S)	CA1NI3
CA1NI5 (S)	CA1NI5
CA2NI7 (S)	CA2NI7
CA305SI1 (HATRURITE) (ASS1)	CA305SI1
CA204SI1 (LARNITE) (ASS1)	CA204SI1
CA103SI1 (PSEUDOWOL) (ASS1)	CA103SI1
CA307SI2 (RANKINITE) (ASS1)	CA307SI2
CA103ZR1 (S)	CA103ZR1
CA1SI1 (S)	CA1SI1
CA1SI2 (S)	CA1SI2
CA2SI1 (S)	CA2SI1
CR1LA103 (S)	CR1LA103
CR2RU1 (S)	CR2RU1
CR3RU1 (S)	CR3RU1
CR1SI1 (S) (2)	CR1SI1
CR1SI2 (S) (2)	CR1SI2
CR3SI1 (S) (2)	CR3SI1
CR5SI3 (S) (2)	CR5SI3
FE1LA103 (S)	FE1LA103
FE12LA1019.5 (S)	FE12LA10195
FE10022SR7 (S)	FE10022SR7
FE12019SR1 (S)	FE12019SR1
FE205SR2 (S)	FE205SR2
FE206SR3 (S)	FE206SR3
FE1SI1 (S)	FE1SI1
FE1SI2 (S)	FE1SI2

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LatSubSol name	TDB name
FE2SI1 (S)	FE2SI1
FE3SI7 (S)	FE3SI7
FE5SI3 (S)	FE5SI3
FE1U6 (S)	FE1U6
FE1ZR2 (S)	FE1ZR2
FE1ZR3 (S)	FE1ZR3
FE735ZR265 (S)	FE735ZR265
IN1LA1 (S)	IN1LA1
IN1LA2 (S)	IN1LA2
IN1LA3 (S)	IN1LA3
IN2LA1 (S)	IN2LA1
IN3LA1 (S)	IN3LA1
IN5LA3 (S)	IN5LA3
IN1MG2 (S)	IN1MG2
IN1MG3 (S)	IN1MG3
IN2MG5 (S)	IN2MG5
IN7MG3 (S)	IN7MG3
IN1NI1 (S)	IN1NI1
IN1NI2 (S)	IN1NI2
IN1NI3 (S)	IN1NI3
IN3NI2 (S)	IN3NI2
IN42NI58 (S)	IN42NI58
IN7NI3 (S)	IN7NI3
IN2O3 (S)	IN2O3
IN2O4SR1 (S)	IN2O4SR1
IN1SR1 (S)	IN1SR1
IN1SR3 (S)	IN1SR3
IN2SR1 (S)	IN2SR1
IN2SR3 (S)	IN2SR3
IN3SR1 (S)	IN3SR1
IN3SR2 (S)	IN3SR2
IN5SR1 (S)	IN5SR1
IN5SR2 (S)	IN5SR2
IN3U1 (S)	IN3U1
IN1ZR3 (S)	IN1ZR3
IN3ZR1 (S)	IN3ZR1
IN1ZR1 (S)	IN1ZR1
IN1ZR2 (S)	IN1ZR2
IN2ZR1 (S)	IN2ZR1
LA1 (DHCP)	LA
LA1MG1 (S)	LA1MG1
LA1MG12 (S)	LA1MG12
LA1MG2 (S)	LA1MG2
LA1MG3 (S)	LA1MG3
LA2MG17 (S)	LA2MG17
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LatSubSol name	TDB name
LA1NI1 (S)	LA1NI1
LA1NI3 (S)	LA1NI3
LA1NI5 (S)	LA1NI5
LA2NI3 (S)	LA2NI3
LA2NI7 (S)	LA2NI7
LA3NI1 (S)	LA3NI1
LA7NI16 (S)	LA7NI16
LA7NI3 (S)	LA7NI3
LA5NI19 (S)	LA5NI19
LA2O5SI1 (S)	LA2O5SI1
LA2O7SI2 (S)	LA2O7SI2
LA4O12SI3 (S)	LA4O12SI3
LA4O7SR1 (S)	LA4O7SR1
LA4O9SR3 (S)	LA4O9SR3
LA2O5ZR1 (S)	LA2O5ZR1
LA2O7ZR2 (S)	LA2O7ZR2
LA1RU2 (S)	LA1RU2
LA3RU1 (S)	LA3RU1
LA5RU2 (S)	LA5RU2
LA5RU3 (S)	LA5RU3
LA7RU3 (S)	LA7RU3
LA1SI1 (S)	LA1SI1
LA1SI2 (S)	LA1SI2
LA3SI2 (S)	LA3SI2
MG1NI2 (S)	MG1NI2
MG2NI1 (S)	MG2NI1
MG1O3SI1 (CLINOENSTATITE)	MG1O3SI1_1
MG1O3SI1 (ENSTATITE)	MG1O3SI1_2
MG1O3SI1 (PROENSTATITE)	MG1O3SI1_3
MG2SI1 (S)	MG2SI1
MG17SR2 (S)	MG17SR2
MG2SR1 (S)	MG2SR1
MG23SR6 (S)	MG23SR6
MG38SR9 (S)	MG38SR9
NI2O4SI1 (S)	NI2O4SI1
NI3SI1 (HIGH_T)	NI3SI1_1
NI29SI9 (LOW_T)	NI29SI9
NI3SI1 (MEDIUM_T)	NI3SI1_2
NI1SI1 (S)	NI1SI1
NI2SI1 (S)	NI2SI1
NI31SI12 (S)	NI31SI12
NI3SI2 (S)	NI3SI2
NI35SI65 (S)	NI35SI65
NI1SR1 (S)	NI1SR1
NI1U6 (S)	NI1U6
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LatSubSol name	TDB name
NI2U1 (S)	NI2U1
NI5U1 (S)	NI5U1
NI7U5 (S)	NI7U5
NI769U231 (S)	NI769U231
NI778U222 (S)	NI778U222
NI9U7 (S)	NI9U7
NI1ZR1 (S)	NI1ZR1
NI11ZR9 (S)	NI11ZR9
NI1ZR2 (S)	NI1ZR2
NI21ZR8 (S)	NI21ZR8
NI3ZR1 (S)	NI3ZR1
NI5ZR1 (S)	NI5ZR1
NI575ZR425 (S)	NI575ZR425
NI7ZR2 (S)	NI7ZR2
O2RU1 (S)	O2RU1
O2SI1 (CRISTOBALITE)	O2SI1_1
O2SI1 (H_T_QUARTZ)	O2SI1_2
O2SI1 (L_T_QUARTZ)	O2SI1_3
O2SI1 (TRIDYMITE)	O2SI1_4
O3SI1SR1 (S)	O3SI1SR1
O4SI1SR2 (S)	O4SI1SR2
O5SI1SR3 (S)	O5SI1SR3
O4SR2ZR1 (S)	O4SR2ZR1
O7SR3ZR2 (S)	O7SR3ZR2
O3U1 (S)	O3U1
O8U3 (S)	O8U3
O9U4 (S)	O9U4
O2ZR1 (MONOCLINIC)	O2ZR1
RU1SI1 (S)	RU1SI1
RU2SI1 (S)	RU2SI1
RU2SI3 (S)	RU2SI3
RU4SI3 (S)	RU4SI3
RU5SI3 (S)	RU5SI3
RU1U2 (S)	RU1U2
RU4U3 (S)	RU4U3
RU474U526 (S)	RU474U526
RU5U3 (S)	RU5U3
RU1ZR1 (S)	RU1ZR1
RU2ZR1 (S)	RU2ZR1
SI1SR1 (S)	SI1SR1
SI1SR2 (S)	SI1SR2
SI2SR1 (S)	SI2SR1
SI1U3 (HIGH_T)	SI1U3_1
SI1U3 (LOW_T)	SI1U3_2

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LatSubSol name	TDB name
SI1.88U1 (S)	SI188U1
SI3U1 (S)	SI3U1
SI511U489 (S)	SI511U489
SI5U3 (S)	SI5U3
SI1ZR1 (S)	SI1ZR1
SI1ZR2 (S)	SI1ZR2
SI1ZR3 (S)	SI1ZR3
SI2ZR1 (S)	SI2ZR1
SI2ZR3 (S)	SI2ZR3
SI3ZR5 (S)	SI3ZR5
SI4ZR5 (S)	SI4ZR5
B6CA1 (S)	B6CA1
C2CA1 (S)	C2CA1
FE1O4U1 (S)	FE1O4U1
FE333U250ZR417 (e)	FE0333U025ZR0417
FE6U71ZR23 (l)	FE006U071ZR023
FE50U18ZR32 (k)	FE05U018ZR032
AG2C1O3 (S)	AG2C1O3
AG2CR1O4 (S)	AG2CR1O4
AL4FE2O18SI5 (FERROCORDIERITE)	AL4FE2O18SI5
AL2FE3O12SI3 (ALMANDINE)	AL2FE3O12SI3
AL1H3 (S)	AL1H3
AL1H3O3 (S) A	AL1H3O3
AL2CA1H4O10SI2 (S)	AL2CA1H4O10SI2
AL2CA3H12O12 (S)	AL2CA3H12O12
AL2CA4H26O20 (S)	AL2CA4H26O20
AL2H2O4 (S) B	AL2H2O4_1
AL2H2O4 (S) D	AL2H2O4_2
AL2H4O9SI2 (S) D	AL2H4O9SI2_1
AL2H4O9SI2 (S) H	AL2H4O9SI2_2
AL2H4O9SI2 (S) K	AL2H4O9SI2_3
AL2H6O6 (S)	AL2H6O6
B10H14 (C)	B10H14
B1H1O2 (C)	B1H1O2
B1H3O3 (S)	B1H3O3
B2H4O4 (S)	B2H4O4
B3H3O3 (S)	B3H3O3
B5H9 (L)	B5H9
BA1C1O3 (C)	BA1C1O3
BA1CR1O4 (S)	BA1CR1O4
BA1H2 (C)	BA1H2
BA1H2O2 (C)	BA1H2O2
BA1O2 (S)	BA1O2
BA1O4U1 (S)	BA1O4U1

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LatSubSol name	TDB name
C1CA103 (C)	C1CA103
C1FE103 (S)	C1FE103
C1H202 (L)	C1H202
C1H4 (L)	C1H4
C1H401 (L)	C1H401
C1MG103 (C)	C1MG103
C1NI103 (S)	C1NI103
C1O3SR1 (C)	C1O3SR1
C1O5U1 (S)	C1O5U1
C2CA1MG106 (S)	C2CA1MG106
C2H402 (L)	C2H402
C2H6 (L)	C2H6
C2H601 (L)	C2H601
C2H602 (L)	C2H602
C2MG1 (S)	C2MG1
C3H6 (L)	C3H6
C3H601 (L)	C3H601
C3H602 (L)	C3H602
C3H8 (L)	C3H8
C3H801 (L)	C3H801
C3H803 (L)	C3H803
C3MG2 (S)	C3MG2
C4NI104 (L)	C4NI104
C5FE105 (L)	C5FE105
C6CR106 (S)	C6CR106
CA1H2 (C)	CA1H2
CA1H202 (S)	CA1H202
CA1H407SI2 (S)	CA1H407SI2
CA1O2 (S)	CA1O2
CA1O4U1 (S)	CA1O4U1
CA2H2 . 33305 . 166SI1 (S)	CA2H233305166SI1
CA2H2MG5024SI8 (S)	CA2H2MG5024SI8
CA2H5010 . 5SI3 (S)	CA2H50105SI3
CA3H6010SI2 (S)	CA3H6010SI2
CA4H3011 . 5SI3 (S)	CA4H30115SI3
CA5H11022 . 5SI6 (S)	CA5H110225SI6
CA5H21027 . 5SI6 (S)	CA5H210275SI6
CA5H6020SI6 (S)	CA5H6020SI6
CA6H2019SI6 (S)	CA6H2019SI6
CR102 (S)	CR102
CR103 (C)	CR103
CR5012 (S)	CR5012
CR8021 (S)	CR8021
FE1H102 (S)	FE1H102
FE1H202 (S)	FE1H202
FE1H303 (S)	FE1H303
FE2H204 (S)	FE2H204
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LatSubSol name	TDB name
H2LA1 (S)	H2LA1
H2MG1 (S)	H2MG1
H2MG1O2 (S)	H2MG1O2
H2MG3O12SI4 (S)	H2MG3O12SI4
H2MG7O24SI8 (S)	H2MG7O24SI8
H2O1 (L)	H2O1
H2O2SR1 (C)	H2O2SR1
H2O4U1 (S)	H2O4U1
H2SR1 (C)	H2SR1
H2ZR1 (S)	H2ZR1
H3LA1O3 (S)	H3LA1O3
H3U1 (S)	H3U1
H4MG3O9SI2 (S)	H4MG3O9SI2
H4O5U1 (S)	H4O5U1
H6SI2 (S)	H6SI2
MG1O4U1 (S)	MG1O4U1
O2SR1 (S)	O2SR1
C3SI16U20 (T2)	C3SI16U20
C2SI2U3 (T1)	C2SI2U3
AL4CA3MG1O10 (S)	AL4CA3MG1O10
AL28CA2MG2O46 (S)	AL28CA2MG2O46
AL16CA1MG2O27 (S)	AL16CA1MG2O27
AL18MG7O40SI3 (SAPHIRINE)	AL18MG7O40SI3
AL4MG2O18SI5 (CORDIERITE)	AL4MG2O18SI5
CA2MG1O7SI2 (AKERMANITE)	CA2MG1O7SI2
CA3MG1O8SI2 (S) (MERWINITE)	CA3MG1O8SI2

1.3 Condensed Solutions

LatSubSol name	mult	atoms	TDB name
LIQUID	3	Ag, Al, O, Si, Ca, B, Ba, La, Sr, C, Cr, Fe, In, Mg, Ni, U, Zr, Ru	LIQUID
FCC_C1	2	Ba, O, Ca, Fe, In, La, Mg, Sr, U, Zr	FCCC1
TET (OXIDE)	1	Ba, O, Fe, In, La, Mg, U, Zr	TETOXIDE
PEROVSKITE	1	Ba, O, U, Zr, Sr	PEROVSKITE
FCC_B1 (4)	2	C, U, Zr, O	FCCB14
BCT	1	C, U, O	BCT
B4C1	1	B, C	B4C1
BCC_A2 (1)	1	Al, C, Cr, Fe, In, La, Mg, Ni, Ru, Si, U, Zr	BCCA21
BCC_A2 (2)	2	Ag, C, Al, Cr, Fe, In, Ni, Ru, Si, U, Zr, O	BCCA22
BCC_A2 (3)	1	Ba, Ca, Sr	BCCA23
BCC_A2 (4)	1	Ag, C, Ca, In, La, Mg	BCCA24
BCC_A2 (5)	1	In, Ni	BCCA25
BCC_A2 (6)	1	Ag, Al, In, Mg	BCCA26
FCC_A1 (1)	1	Ag, C, Al, Cr, Fe, In, Ni, Ru, Si, U, Zr	FCCA11
FCC_A1 (2)	1	Ag, Al, In, Mg	FCCA12
FCC_A1 (3)	1	Ba, Ca, La, Sr	FCCA13
FCC_A1 (4)	1	Ag, C, Ba, Ca, In, La, Mg	FCCA14
FCC_L10, BETA'	1	In, Mg	FCCL10BETA
FCC_L12, BETA"	1	In, Mg	FCCL12BETA
HCP_A3 (1)	2	Ag, C, Al, Cr, Fe, In, Mg, Ni, Ru, U, Zr, O	HCPA31
HCP_A3 (2)	1	Ag, Al, In	HCPA32
HCP_A3 (3)	1	In, Ni	HCPA33
LAVES	2	Cr, Fe, U, Zr	LAVES
FCC_B1 (1)	1	Ca, O, Fe, Mg, Ni, Sr	FCCB11
FCC_B1 (2)	1	Al, O, Ca, Cr, Fe, Mg, Ni, Si	FCCB12
FCC_B1 (3)	2	Ba, O, Ca, Fe, Mg, Ni, Sr	FCCB13
RHO	2	Al, O, Cr, Fe	RHO
SPINEL	1	Al, Fe, O, Mg, Ni, Cr	SPINEL
CC	1	Ba, O, Ca, La, Sr, Zr	CC
TCHERNOBYLITE	1	O, Si, U, Zr	TCHERNOBYLITE
MULLITE	1	Al, B, O, Si	MULLITE
M7C3	1	C, Cr, Fe, Ni	M7C3
M23C6 (1)	1	C, Cr, Fe, Ni	M23C61
M3C1	1	B, Cr, Fe, Ni, C	M3C1
C2LA (1+x) (HT)	1	C, La	C2LA1xHT
C3LA (2+x)	1	C, La	C3LA2x
BETA_B	1	B, C, Si	BETAB
DIA_A4	1	B, Ru, Si	DIAA4
M23C6 (2)	1	B, Fe, C	M23C62
SIGMA	1	Cr, Fe, Ni	SIGMA

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LatSubSol name	mult	atoms	TDB name
TET (METAL)	1	Al, Cr, Fe, Ru, Si, U, Zr	TETMETAL
ORT_A20	1	Fe, Si, U, Zr	ORTA20
DELTA	1	U, Zr	DELTA
BCC_A12	1	Al, Mg	BCCA12
CUB_A13	1	Ag, Al	CUBA13
TET_A6	1	In, Mg	TETA6
CWS_WOLLASTONITE	2	Ca, O, Si, Fe, Mg	CWSWOLLASTONITE
SI2U3 (SS)	1	C, Si, U	SI2U3SS
ALPHA (C2S)	1	Ca, O, Si, Mg	ALPHAC2S
ALPHA2 (C2S)	1	Ca, O, Si, Mg	ALPHA2C2S
DIOPSIDE	1	Ca, Mg, O, Si	DIOPSIDE
CW2S_OLIVINE	2	Ca, O, Si, Fe, Mg	CW2SOLIVINE
CxRU3U1 (SS)	1	C, Ru, U	CxRU3U1SS
T (SS)	1	Al, Ca, O, Fe	TSS
CA2	1	Al, Ca, O, Fe	CA2sto
C2F	1	Al, Ca, O, Fe	C2F
CA6	1	Al, Ca, O, Fe	CA6sto
CA	2	Al, Ca, O, Fe	CAsto
C3A	1	Al, Ca, O, Fe	C3A

1.4 Gas

LatSubSol name	TDB name
AG1 (G)	AG
AG1O1 (G)	AG1O1
AG2 (G)	AG2
AL1 (G)	AL
AL1B1O2 (G)	AL1B1O2
AL1C1 (G)	AL1C1
AL1C2 (G)	AL1C2
AL1H1 (G)	AL1H1
AL1H1O1 (G) 1	AL1H1O1_1
AL1H1O1 (G) 2	AL1H1O1_2
AL1H1O2 (G)	AL1H1O2
AL1H2 (G)	AL1H2
AL1H2O2 (G)	AL1H2O2
AL1H3 (G)	AL1H3
AL1O1 (G)	AL1O1
AL1O2 (G)	AL1O2
AL2 (G)	AL2
AL2C2 (G)	AL2C2
AL2O1 (G)	AL2O1
AL2O2 (G)	AL2O2
AL2O3 (G)	AL2O3
AR1 (G)	AR

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LatSubSol name	TDB name
B1 (G)	B
B10H14 (G)	B10H14
B1BA1O2 (G)	B1BA1O2
B1C1 (G)	B1C1
B1C2 (G)	B1C2
B1H1 (G)	B1H1
B1H1O1 (G) 1	B1H1O1_1
B1H1O1 (G) 2	B1H1O1_2
B1H1O2 (G)	B1H1O2
B1H2 (G)	B1H2
B1H2O1 (G)	B1H2O1
B1H2O2 (G)	B1H2O2
B1H3 (G)	B1H3
B1H3O1 (G)	B1H3O1
B1H3O2 (G)	B1H3O2
B1H3O3 (G)	B1H3O3
B1O1 (G)	B1O1
B1O2 (G)	B1O2
B1O2SR1 (G)	B1O2SR1
B2 (G)	B2
B2C1 (G)	B2C1
B2H4O4 (G)	B2H4O4
B2H6 (G)	B2H6
B2O1 (G)	B2O1
B2O2 (G)	B2O2
B2O3 (G)	B2O3
B3H3O3 (G)	B3H3O3
B3H3O6 (G)	B3H3O6
B5H9 (G)	B5H9
BA1 (G)	BA
BA1H1 (G)	BA1H1
BA1H1O1 (G)	BA1H1O1
BA1H2O2 (G)	BA1H2O2
BA1O1 (G)	BA1O1
BA2O1 (G)	BA2O1
C1 (G)	C
C1H1 (G)	C1H1
C1H1O1 (G)	C1H1O1
C1H1O2 (G)	C1H1O2
C1H2 (G)	C1H2
C1H2O1 (G)	C1H2O1
C1H2O2 (G) C	C1H2O2_1
C1H2O2 (G) T	C1H2O2_2
C1H3 (G)	C1H3
C1H3O1 (G) 1	C1H3O1_1
C1H3O1 (G) 2	C1H3O1_2
C1H4 (G)	C1H4
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LatSubSol name	TDB name
C1H401 (G)	C1H401
C101 (G)	C101
C102 (G)	C102
C1SI1 (G)	C1SI1
C1SI2 (G)	C1SI2
C1SI3 (G)	C1SI3
C1SI4 (G)	C1SI4
C2 (G)	C2
C2H1 (G)	C2H1
C2H2 (G)	C2H2
C2H201 (G)	C2H201
C2H202 (G)	C2H202
C2H3 (G)	C2H3
C2H4 (G)	C2H4
C2H401 (G) 1	C2H401_1
C2H401 (G) 2	C2H401_2
C2H402 (G) 1	C2H402_1
C2H402 (G) 2	C2H402_2
C2H404 (G)	C2H404
C2H5 (G)	C2H5
C2H6 (G)	C2H6
C2H601 (G) 1	C2H601_1
C2H601 (G) 2	C2H601_2
C2H601SI1 (G)	C2H601SI1
C2H602 (G)	C2H602
C2H8SI1 (G)	C2H8SI1
C2O1 (G)	C2O1
C2SI1 (G)	C2SI1
C2SI2 (G)	C2SI2
C2SI3 (G)	C2SI3
C3 (G)	C3
C3H4 (G) 1	C3H4_1
C3H4 (G) 2	C3H4_2
C3H4 (G) 3	C3H4_3
C3H401 (G) 1	C3H401_1
C3H401 (G) 2	C3H401_2
C3H401 (G) 3	C3H401_3
C3H402 (G) 1	C3H402_1
C3H402 (G) 2	C3H402_2
C3H403 (G)	C3H403
C3H6 (G) 1	C3H6_1
C3H6 (G) 2	C3H6_2
C3H601 (G) 1	C3H601_1
C3H601 (G) 2	C3H601_2
C3H601 (G) 3	C3H601_3
C3H601 (G) 4	C3H601_4
C3H601 (G) 5	C3H601_5
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LatSubSol name	TDB name
C3H602 (G)	C3H602
C3H603 (G)	C3H603
C3H7 (G) 1	C3H7_1
C3H7 (G) 2	C3H7_2
C3H8 (G)	C3H8
C3H801 (G) 1	C3H801_1
C3H801 (G) 2	C3H801_2
C3H801 (G) 3	C3H801_3
C3O2 (G)	C3O2
C4 (G)	C4
C4NI104 (G)	C4NI104
C5 (G)	C5
C5FE105 (G)	C5FE105
C6CR106 (G)	C6CR106
CA1 (G)	CA
CA1H1 (G)	CA1H1
CA1H101 (G)	CA1H101
CA1H202 (G)	CA1H202
CA101 (G)	CA101
CA2 (G)	CA2
CR1 (G)	CR
CR101 (G)	CR101
CR102 (G)	CR102
CR103 (G)	CR103
CR2 (G)	CR2
FE1 (G)	FE
FE1H202 (G)	FE1H202
FE101 (G)	FE101
FE2 (G)	FE2
H1 (G)	H
H1IN1 (G)	H1IN1
H1IN101 (G)	H1IN101
H1MG1 (G)	H1MG1
H1MG101 (G)	H1MG101
H1NI1 (G)	H1NI1
H1O1 (G)	H1O1
H1O1SR1 (G)	H1O1SR1
H1O2 (G)	H1O2
H1SI1 (G)	H1SI1
H1SR1 (G)	H1SR1
H1ZR1 (G)	H1ZR1
H2 (G)	H2
H2MG102 (G)	H2MG102
H2NI102 (G)	H2NI102
H2O1 (G)	H2O1
H2O2 (G)	H2O2
H2O2SR1 (G)	H2O2SR1
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LatSubSol name	TDB name
H2SI1 (G)	H2SI1
H3SI1 (G)	H3SI1
H4SI1 (G)	H4SI1
H6SI2 (G)	H6SI2
IN1 (G)	IN
IN1O1 (G)	IN1O1
IN2 (G)	IN2
IN2O1 (G)	IN2O1
LA1 (G)	LA
LA1O1 (G)	LA1O1
LA2O1 (G)	LA2O1
LA2O2 (G)	LA2O2
MG1 (G)	MG
MG1O1 (G)	MG1O1
MG2 (G)	MG2
NI1 (G)	NI
NI1O1 (G)	NI1O1
O1 (G)	O
O1SI1 (G)	O1SI1
O1SR1 (G)	O1SR1
O1U1 (G)	O1U1
O1ZR1 (G)	O1ZR1
O2 (G)	O2
O2SI1 (G)	O2SI1
O2SI2 (G)	O2SI2
O2U1 (G)	O2U1
O2ZR1 (G)	O2ZR1
O3 (G)	O3
H1O1RU1 (G)	H1O1RU1
H2O2RU1 (G)	H2O2RU1
O1RU1 (G)	O1RU1
O2RU1 (G)	O2RU1
O3RU1 (G)	O3RU1
O3U1 (G)	O3U1
O4RU1 (G)	O4RU1
RU1 (G)	RU
SI1 (G)	SI
SI2 (G)	SI2
SI3 (G)	SI3
SR1 (G)	SR
SR2 (G)	SR2
U1 (G)	U
ZR1 (G)	ZR
ZR2 (G)	ZR2

2 Assessed Systems

2.1 Binary Systems

assessed binary systems								
Ag – Al	Ag – B	Ag – Ba	Ag – C	Ag – Ca	Ag – Cr	Ag – Fe	Ag – In	Ag – La
Ag – Mg	Ag – Ni	Ag – O	Ag – Ru	Ag – Si	Ag – Sr	Ag – U	Ag – Zr	Al – B
Al – Ba	Al – C	Al – Ca	Al – Cr	Al – Fe	Al – In	Al – La	Al – Mg	Al – Ni
Al – O	Al – Ru	Al – Si	Al – Sr	Al – U	Al – Zr	B – Ba	B – C	B – Ca
B – Cr	B – Fe	B – In	B – La	B – Mg	B – Ni	B – O	B – Ru	B – Si
B – Sr	B – U	B – Zr	Ba – C	Ba – Ca	Ba – Cr	Ba – Fe	Ba – In	Ba – La
Ba – Mg	Ba – Ni	Ba – O	Ba – Ru	Ba – Si	Ba – Sr	Ba – U	Ba – Zr	C – Ca
C – Cr	C – Fe	C – In	C – La	C – Mg	C – Ni	C – O	C – Ru	C – Si
C – Sr	C – U	C – Zr	Ca – Cr	Ca – Fe	Ca – In	Ca – La	Ca – Mg	Ca – Ni
Ca – O	Ca – Ru	Ca – Si	Ca – Sr	Ca – U	Ca – Zr	Cr – Fe	Cr – In	Cr – La
Cr – Mg	Cr – Ni	Cr – O	Cr – Si	Cr – Ru	Cr – Sr	Cr – U	Cr – Zr	Fe – In
Fe – La	Fe – Mg	Fe – Ni	Fe – O	Fe – Ru	Fe – Si	Fe – Sr	Fe – U	Fe – Zr
In – La	In – Mg	In – Ni	In – O	In – Ru	In – Si	In – Sr	In – U	In – Zr
La – Mg	La – Ni	La – O	La – Ru	La – Si	La – Sr	La – U	La – Zr	Mg – Ni
Mg – O	Mg – Ru	Mg – Si	Mg – Sr	Mg – U	Mg – Zr	Ni – O	Ni – Ru	Ni – Si
Ni – Sr	Ni – U	Ni – Zr	O – Ru	O – Si	O – U	O – Sr	O – Zr	Ru – Si
Ru – Sr	Ru – U	Ru – Zr	Si – Sr	Si – U	Si – Zr	Sr – U	Sr – Zr	U – Zr

2.2 Ternary Systems

system	assessed sub-systems
Al – B – O	Al ₂ O ₃ – B ₂ O ₃
Al – Ba – O	Al ₂ O ₃ – BaO
Al – Ca – O	Al ₂ O ₃ – CaO
Al – Cr – O	Al ₂ O ₃ – Cr ₂ O ₃
Al – Fe – O	Al ₂ O ₃ – FeO – Fe ₂ O ₃
Al – In – O	Al ₂ O ₃ – In ₂ O ₃
Al – La – O	Al ₂ O ₃ – La ₂ O ₃
Al – Mg – O	Al ₂ O ₃ – MgO
Al – Ni – O	Al ₂ O ₃ – NiO
Al – O – Si	Al ₂ O ₃ – SiO ₂
Al – O – Sr	Al ₂ O ₃ – SrO
Al – O – U	Al ₂ O ₃ – UO ₂
Al – O – Zr	Al ₂ O ₃ – ZrO ₂
B – Ba – O	B ₂ O ₃ – BaO
B – C – Fe	full
B – C – U	full
B – C – Zr	full
B – Ca – O	B ₂ O ₃ – CaO

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system	assessed sub-systems
B – Cr – O	B ₂ O ₃ – Cr ₂ O ₃
B – Fe – O	B ₂ O ₃ – FeO – Fe ₂ O ₃
B – Fe – U	full
B – Fe – Zr	full
B – In – O	B ₂ O ₃ – In ₂ O ₃
B – La – O	B ₂ O ₃ – La ₂ O ₃
B – Mg – O	B ₂ O ₃ – MgO
B – Ni – O	B ₂ O ₃ – NiO
B – O – Si	B ₂ O ₃ – SiO ₂
B – O – Sr	B ₂ O ₃ – SrO
B – O – U	B ₂ O ₃ – UO ₂
B – O – Zr	B ₂ O ₃ – ZrO ₂
Ba – Ca – O	BaO – CaO
Ba – Cr – O	BaO – Cr ₂ O ₃
Ba – Fe – O	BaO – FeO BaO – Fe ₂ O ₃
Ba – In – O	BaO – In ₂ O ₃
Ba – La – O	BaO – La ₂ O ₃
Ba – Mg – O	BaO – MgO
Ba – Ni – O	BaO – NiO
Ba – O – Si	BaO – SiO ₂
Ba – O – Sr	BaO – SrO
Ba – O – U	BaO – UO ₂
Ba – O – Zr	BaO – ZrO ₂
C – Cr – Fe	full
C – Cr – Ni	full
C – Fe – Ni	full
C – O – U	full
C – O – Zr	full
C – U – Zr	full
Ca – Cr – O	CaO – CrO – Cr ₂ O ₃
Ca – Fe – O	CaO – FeO – Fe ₂ O ₃
Ca – In – O	CaO – In ₂ O ₃
Ca – La – O	CaO – La ₂ O ₃
Ca – Mg – O	CaO – MgO
Ca – Ni – O	CaO – NiO
Ca – O – Si	CaO – SiO ₂
Ca – O – Sr	CaO – SrO
Ca – O – U	CaO – UO ₂
Ca – O – Zr	CaO – ZrO ₂
Cr – Fe – O	full
Cr – Fe – Ni	full
Cr – Fe – Zr	full
Cr – In – O	Cr ₂ O ₃ – In ₂ O ₃
Cr – La – O	Cr ₂ O ₃ – La ₂ O ₃
Cr – Mg – O	Cr ₂ O ₃ – MgO
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system	assessed sub-systems
Cr – Ni – O	full
Cr – O – Si	CrO – Cr ₂ O ₃ – SiO ₂
Cr – O – Sr	Cr ₂ O ₃ – SrO
Cr – O – U	Cr ₂ O ₃ – UO ₂
Cr – O – Zr	Cr ₂ O ₃ – ZrO ₂
Fe – In – O	FeO – In ₂ O ₃ Fe ₂ O ₃ – In ₂ O ₃
Fe – La – O	FeO – La ₂ O ₃ Fe ₂ O ₃ – La ₂ O ₃
Fe – Mg – O	FeO – MgO Fe ₂ O ₃ – MgO
Fe – Ni – O	full
Fe – O – Si	FeO – Fe ₂ O ₃ – SiO ₂
Fe – O – Sr	FeO – SrO Fe ₂ O ₃ – SrO
Fe – O – U	full
Fe – O – Zr	full
Fe – U – Zr	full
In – La – O	In ₂ O ₃ – La ₂ O ₃
In – Mg – O	In ₂ O ₃ – MgO
In – Ni – O	In ₂ O ₃ – NiO
In – O – Si	In ₂ O ₃ – SiO ₂
In – O – Sr	In ₂ O ₃ – SrO
In – O – U	In ₂ O ₃ – UO ₂
In – O – Zr	In ₂ O ₃ – ZrO ₂
La – Mg – O	La ₂ O ₃ – MgO
La – Ni – O	La ₂ O ₃ – NiO
La – O – Si	La ₂ O ₃ – SiO ₂
La – O – Sr	La ₂ O ₃ – SrO
La – O – U	La ₂ O ₃ – UO ₂
La – O – Zr	La ₂ O ₃ – ZrO ₂
Mg – Ni – O	MgO – NiO
Mg – O – Si	MgO – SiO ₂
Mg – O – Sr	MgO – SrO
Mg – O – U	MgO – UO ₂
Mg – O – Zr	MgO – ZrO ₂
Ni – O – Si	NiO – SiO ₂
Ni – O – Sr	NiO – SrO
Ni – O – U	NiO – UO ₂
Ni – O – Zr	NiO – ZrO ₂
O – Si – Sr	SrO – SiO ₂
O – Si – U	SiO ₂ – UO ₂
O – Si – Zr	SiO ₂ – ZrO ₂
O – Sr – U	SrO – UO ₂
O – Sr – Zr	SrO – ZrO ₂
O – U – Zr	full

2.3 Quaternary Systems

system	assessed sub-systems
Al – B – Ca – O	Al ₂ O ₃ – B ₂ O ₃ – CaO
Al – B – O – Si	Al ₂ O ₃ – B ₂ O ₃ – SiO ₂
Al – B – O – Mg	Al ₂ O ₃ – B ₂ O ₃ – MgO
Al – Ca – Fe – O	Al ₂ O ₃ – CaO – FeO – Fe ₂ O ₃
Al – Ca – O – Si	Al ₂ O ₃ – CaO – SiO ₂
Al – Fe – O – Si	Al ₂ O ₃ – FeO – Fe ₂ O ₃ – SiO ₂
Al – O – Si – U	Al ₂ O ₃ – SiO ₂ – UO ₂
Al – O – Si – Zr	Al ₂ O ₃ – SiO ₂ – ZrO ₂
Al – O – U – Ar	Al ₂ O ₃ – UO ₂ – ZrO ₂
B – Ca – Mg – O	B ₂ O ₃ – CaO – MgO
B – Ca – O – Si	B ₂ O ₃ – CaO – SiO ₂
B – Mg – O – Si	B ₂ O ₃ – MgO – SiO ₂
Ca – Cr – O – Si	CaO – CrO – Cr ₂ O ₃ – SiO ₂
Ca – Fe – O – Si	CaO – FeO – Fe ₂ O ₃ – SiO ₂
O – Si – U – Zr	SiO ₂ – UO ₂ – ZrO ₂

3 Major Updates from NUCLEA-10 to NUCLEA-15

The description of some binary systems have been improved:

- Ag – Al: improved limits of the **FCC_A1+HCP_A3** biphasic domain.
- Ag – B: added **LIQUID** miscibility gap.
- Al – In: improved limits of the **LIQUID** miscibility gap.
- Al – Zr: added **AL3ZR4 (S)** and improved modelling of the stoichiometric condensed phases.
- B – C: **BETA_B** decomposition changed to peritectic.
- C – U: **C3U2 (S)** made unstable at low temperature.
- Cr – La: improved modelling of **LIQUID**.
- Cr – O: improved modelling of **LIQUID**.
- In – Zr: added **IN1ZR1 (S)**, **IN2ZR1 (S)**, **IN1ZR2 (S)**; **IN3ZR1 (S)** decomposition changed to peritectic.
- La – Ni: added **LA5NI19 (S)**.

The description of some ternary systems have been improved:

- Al – O – Fe: Al_2FeO_4 decomposition changed to peritectic in $\text{AlO}_{1.5} - \text{FeO}$; **SPINEL** domain extended in $\text{AlO}_{1.5} - \text{FeO}_{1.5}$.
- Ca – Cr – O: added assessment of $\text{CaO} - \text{CrO} - \text{Cr}_2\text{O}_3$ for oxygen partial pressures ranging from equilibrium with metallic chromium to $P_{\text{O}_2} = 10^{-3}$ atm.
- Cr – O – Si: added assessment of $\text{CrO} - \text{Cr}_2\text{O}_3 - \text{SiO}_2$ for oxygen partial pressures ranging from equilibrium with metallic chromium to $P_{\text{O}_2} = 0.21$ atm.
- Ni – O – Si: improved limits of the **LIQUID** miscibility gap in $\text{NiO} - \text{SiO}_2$; improved modelling of **NI2O4SI1 (S)**.

The description of some quaternary systems have been improved:

- Al – Ca – Fe – O: added assessments of $\text{Al}_2\text{O}_3 - \text{CaO} - \text{Fe}_2\text{O}_3$ and $\text{Al}_2\text{O}_3 - \text{CaO} - \text{FeO}$.
- Al – Fe – O – Si: added assessments of $\text{Al}_2\text{O}_3 - \text{Fe}_2\text{O}_3 - \text{SiO}_2$ and $\text{Al}_2\text{O}_3 - \text{FeO} - \text{SiO}_2$.
- Ca – Cr – O – Si: improved assessment of $\text{CaO} - \text{CrO} - \text{Cr}_2\text{O}_3$ for reducing conditions and for oxidising conditions at low CaO-content; added **CA3CR2O12SI3 (UVAROVITE)**, **CA5CR5O50SI20 (GILLESPIE)**.

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