

# **IRSN Mephista-20 Nuclear Fuels Database (MEPH20)**

## **Overview Including Phase and System Information**

*Available Starting with Thermo-Calc Version 2022b*



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# Overview of Mephista-20

January 10, 2022

## 1 General Description

### 1.1 Atoms

15 + 2 atoms

U, Pu, O

Fe, Si, C, Zr, Cr

Ba, La, Ru, Sr, Cs, Mo, Ce

Ar, H

fuel

cladding

fission products

gas

### 1.2 Stoichiometric Condensed Phases

| NTB name               | TDB name      |
|------------------------|---------------|
| BA1C2 (S)              | BA1C2_S       |
| BA1C1O3 (C)            | BA1C1O3_S     |
| BA1CE1O3 (S)           | BA1CE1O3_S    |
| BA1CR1O4 (S)           | BA1CR1O4_S    |
| BA1CR2O4 (S)           | BA1CR2O4_S    |
| BA3CR2O6 (S)           | BA3CR2O6_S    |
| BA1CS2MO2O8 (S)        | BA1CS2MO2O8_S |
| BA1FE2O4 (S)           | BA1FE2O4_S    |
| BA1FE12O19 (S)         | BA1FE12O19_S  |
| BA2FE2O5 (S)           | BA2FE2O5_S    |
| BA2FE6O11 (S)          | BA2FE6O11_S   |
| BA7FE4O13 (S)          | BA7FE4O13_S   |
| BA1H2 (C)              | BA1H2_S01     |
| BA1H2O2 (C)            | BA1H2O2_S     |
| BA1LA2O4 (S)           | BA1LA2O4_S    |
| BA1MO1O4 (S)           | BA1MO1O4_S    |
| BA1MO2O7 (S)           | BA1MO2O7_S    |
| BA2MO1O5 (S)           | BA2MO1O5_S    |
| BA3MO1O6 (S)           | BA3MO1O6_S    |
| BA1O2 (S)              | BA1O2_S       |
| BA1O3SI1 (S)           | BA1O3SI1_S    |
| BA1O5SI2 (S)           | BA1O5SI2_S    |
| BA2O4SI1 (S)           | BA2O4SI1_S    |
| BA2O8SI3 (S)           | BA2O8SI3_S    |
| BA3O5SI1 (S)           | BA3O5SI1_S    |
| BA3O13SI5 (S)          | BA3O13SI5_S   |
| BA5O21SI8 (S)          | BA5O21SI8_S   |
| BA1O4U1 (S)            | BA1O4U1_S     |
| BA1SI1 (S)             | BA1SI1_S      |
| BA1SI2 (S)             | BA1SI2_S      |
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|------------------------------|-------------|
| NTB name                     | TDB name    |
| BA2SI1 (S)                   | BA2SI1_S    |
| BA3SI4 (S)                   | BA3SI4_S    |
| BA5SI3 (S)                   | BA5SI3_S    |
| C1 (GRA_HEX_A9)              | C_S11       |
| C2CE1 (S)                    | C2CE1_S     |
| C3CE2 (S)                    | C3CE2_S     |
| C2CR3 (M3C2) (C-CR-FE-NI)    | C2CR3_S     |
| C6CR106 (S)                  | C6CR106_S   |
| C8CS1 (S)                    | C8CS1_S     |
| C10CS1 (S)                   | C10CS1_S    |
| C24CS1 (S)                   | C24CS1_S    |
| C36CS1 (S)                   | C36CS1_S    |
| C48CS1 (S)                   | C48CS1_S    |
| C60CS1 (S)                   | C60CS1_S    |
| C1CS203 (S)                  | C1CS203_S   |
| C1FE103 (S)                  | C1FE103_S   |
| C5FE105 (L)                  | C5FE105_L   |
| C1H4 (L)                     | C1H4_L02    |
| C2H6 (L)                     | C2H6_L04    |
| C3H6 (L)                     | C3H6_L05    |
| C3H8 (L)                     | C3H8_L06    |
| C1H2O2 (L)                   | C1H2O2_L    |
| C1H4O1 (L)                   | C1H4O1_L    |
| C2H4O2 (L)                   | C2H4O2_L    |
| C2H6O1 (L)                   | C2H6O1_L    |
| C2H6O2 (L)                   | C2H6O2_L    |
| C3H6O1 (L)                   | C3H6O1_L    |
| C3H6O2 (L)                   | C3H6O2_L    |
| C3H8O1 (L)                   | C3H8O1_L    |
| C3H8O3 (L)                   | C3H8O3_L    |
| C2LA1 (S) LT                 | C2LA1_S     |
| C1MO1 (S)                    | C1MO1_S03   |
| C1MO106 (S)                  | C1MO106_S   |
| C6MO106 (S)                  | C6MO106_S   |
| C1.7MO1U1 (S)                | C1_7MO1U1_S |
| C2MO1U1 (S)                  | C2MO1U1_S   |
| C1O3SR1 (C)                  | C1O3SR1_S   |
| C1O5U1 (S)                   | C1O5U1_S    |
| C0.4PU0.6 (S)                | C0_4PU0_6_S |
| C2RU1U2 (S)                  | C2RU1U2_S   |
| C1SI1 (S)                    | C1SI1_S     |
| C2SI2U3 (S)                  | C2SI2U3_S   |
| C3SI16U20 (S)                | C3SI16U20_S |
| C2SR1 (S)                    | C2SR1_S     |
| CE1CR103 (S)                 | CE1CR103_S  |
| CE1FE2 (S)                   | CE1FE2_S    |
| CE2FE17 (S)                  | CE2FE17_S   |

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|------------------------------|--------------|
| NTB name                     | TDB name     |
| CE1FE1O3 (S)                 | CE1FE1O3_S   |
| CE1MO2O8 (S)                 | CE1MO2O8_S   |
| CE2MO3O13 (S)                | CE2MO3O13_S  |
| CE5O9 (S)                    | CE5O9_S      |
| CE7O12 (S)                   | CE7O12_S     |
| CE11O20 (S)                  | CE11O20_S    |
| CE19O34 (S)                  | CE19O34_S    |
| CE26O47 (S)                  | CE26O47_S    |
| CE2O5SI1 (S)                 | CE2O5SI1_S   |
| CE2O7SI2 (S)                 | CE2O7SI2_S   |
| CE14O39SI9 (S)               | CE14O39SI9_S |
| CE1O3SR1 (S)                 | CE1O3SR1_S   |
| CE2O7ZR2 (S)                 | CE2O7ZR2_S   |
| CE1RU2 (S)                   | CE1RU2_S     |
| CE3RU1 (S)                   | CE3RU1_S     |
| CE4RU3 (S)                   | CE4RU3_S     |
| CE7RU3 (S)                   | CE7RU3_S     |
| CE16RU9 (S)                  | CE16RU9_S    |
| CE1SI1 (S)                   | CE1SI1_S     |
| CE1SI2 (S)                   | CE1SI2_S     |
| CE3SI2 (S)                   | CE3SI2_S     |
| CE3SI5 (S)                   | CE3SI5_S     |
| CE5SI3 (S)                   | CE5SI3_S     |
| CE5SI4 (S)                   | CE5SI4_S     |
| CR1LA1O3 (S)                 | CR1LA1O3_S   |
| CR1O2 (S)                    | CR1O2_S      |
| CR1O3 (C)                    | CR1O3_S      |
| CR5O12 (S)                   | CR5O12_S     |
| CR8O21 (S)                   | CR8O21_S     |
| CR3O1ZR3 (S)                 | CR3O1ZR3_S   |
| CR2RU1 (S)                   | CR2RU1_S     |
| CR3RU1 (S)                   | CR3RU1_S     |
| CR1SI1 (S)                   | CR1SI1_S     |
| CR1SI2 (S)                   | CR1SI2_S     |
| CR3SI1 (S)                   | CR3SI1_S     |
| CR5SI3 (S)                   | CR5SI3_S     |
| CS1 (BCC_A2)                 | CS_S10       |
| CS1H1 (S)                    | CS1H1_S07    |
| CS1H1O1 (C)                  | CS1H1O1_S    |
| CS2MO2O7 (S)                 | CS2MO2O7_S   |
| CS2MO3O10 (S)                | CS2MO3O10_S  |
| CS2MO4O13 (S)                | CS2MO4O13_S  |
| CS2MO5O16 (S)                | CS2MO5O16_S  |
| CS2MO7O22 (S)                | CS2MO7O22_S  |
| CS1O2 (S)                    | CS1O2_S      |
| CS2O1 (S)                    | CS2O1_S08    |
| CS2O2 (S)                    | CS2O2_S09    |
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|------------------------------|----------------|
| NTB name                     | TDB name       |
| CS7O1 (S)                    | CS7O1_S        |
| CS2O4RU1 (S)                 | CS2O4RU1_S     |
| CS2O3SI1 (C)                 | CS2O3SI1_S     |
| CS2O5SI2 (C)                 | CS2O5SI2_S     |
| CS2O9SI4 (C)                 | CS2O9SI4_S     |
| CS2O3.56U1 (S)               | CS2O3_56U1_S   |
| CS2O4U1 (S)                  | CS2O4U1_S      |
| CS2O7U2 (S)                  | CS2O7U2_S      |
| CS2O12U4 (S)                 | CS2O12U4_S     |
| CS2O13U4 (S)                 | CS2O13U4_S     |
| CS2O16U5 (S)                 | CS2O16U5_S     |
| CS2O18U6 (S)                 | CS2O18U6_S     |
| CS2O22U7 (S)                 | CS2O22U7_S     |
| CS2O27U9 (S)                 | CS2O27U9_S     |
| CS2O46U15 (S)                | CS2O46U15_S    |
| CS4O17U5 (S)                 | CS4O17U5_S     |
| CS2O3ZR1 (S)                 | CS2O3ZR1_S     |
| CS4O4ZR1 (S)                 | CS4O4ZR1_S     |
| CS4O16ZR7 (S)                | CS4O16ZR7_S    |
| CS6O17ZR7 (S)                | CS6O17ZR7_S    |
| FE1H1O2 (S)                  | FE1H1O2_S      |
| FE1H2O2 (S)                  | FE1H2O2_S      |
| FE1H3O3 (S)                  | FE1H3O3_S      |
| FE1LA1O3 (S)                 | FE1LA1O3_S     |
| FE12LA1O19.5 (S)             | FE12LA1O19_5_S |
| FE2MO1 (S) Laves_C14         | FE2MO1_S       |
| FE1MO1O4 (S)                 | FE1MO1O4_S     |
| FE1O3SI1 (S) Wollastonite    | FE1O3SI1_S     |
| FE2O4SI1 (S) Fayalite        | FE2O4SI1_S     |
| FE2O5SR2 (S)                 | FE2O5SR2_S     |
| FE2O6SR3 (S)                 | FE2O6SR3_S     |
| FE1O22SR7 (S)                | FE1O22SR7_S    |
| FE12O19SR1 (S)               | FE12O19SR1_S   |
| FE1O4U1 (S)                  | FE1O4U1_S      |
| FE1SI1 (S)                   | FE1SI1_S       |
| FE1SI2 (S)                   | FE1SI2_S       |
| FE2SI1 (S)                   | FE2SI1_S       |
| FE3SI7 (S)                   | FE3SI7_S       |
| FE5SI3 (S)                   | FE5SI3_S       |
| FE4U3ZR5 (S)                 | FE4U3ZR5_S     |
| FE6U71ZR23 (S)               | FE6U71ZR23_S   |
| FE25U9ZR16 (S)               | FE25U9ZR16_S   |
| FE1ZR2 (S)                   | FE1ZR2_S       |
| FE1ZR3 (S)                   | FE1ZR3_S       |
| FE73ZR27 (S)                 | FE73ZR27_S     |
| H2LA1 (S)                    | H2LA1_S        |
| H3LA1O3 (S)                  | H3LA1O3_S      |

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| NTB name                     | TDB name    |
| H2O1 (L)                     | H2O1_L      |
| H2O2SR1 (C)                  | H2O2SR1_S   |
| H2O4U1 (S)                   | H2O4U1_S    |
| H4O5U1 (S)                   | H4O5U1_S    |
| H2PU1 (S)                    | H2PU1_S     |
| H3PU1 (S)                    | H3PU1_S     |
| H6SI2 (S)                    | H6SI2_S     |
| H2SR1 (C)                    | H2SR1_S     |
| H3U1 (S)                     | H3U1_S      |
| H2ZR1 (S)                    | H2ZR1_S     |
| LA2MO3O12 (S)                | LA2MO3O12_S |
| LA2O5SI1 (S)                 | LA2O5SI1_S  |
| LA2O7SI2 (S)                 | LA2O7SI2_S  |
| LA4O12SI3 (S)                | LA4O12SI3_S |
| LA4O7SR1 (S)                 | LA4O7SR1_S  |
| LA4O9SR3 (S)                 | LA4O9SR3_S  |
| LA2O5ZR1 (S)                 | LA2O5ZR1_S  |
| LA2O7ZR2 (S)                 | LA2O7ZR2_S  |
| LA1RU2 (S)                   | LA1RU2_S    |
| LA3RU1 (S)                   | LA3RU1_S    |
| LA5RU2 (S)                   | LA5RU2_S    |
| LA5RU3 (S)                   | LA5RU3_S    |
| LA7RU3 (S)                   | LA7RU3_S    |
| LA1SI1 (S)                   | LA1SI1_S    |
| LA1SI2 (S)                   | LA1SI2_S    |
| LA3SI2 (S)                   | LA3SI2_S    |
| MO1O2 (S)                    | MO1O2_S     |
| MO1O2.75 (S)                 | MO1O2_75_S  |
| MO1O2.875 (S)                | MO1O2_875_S |
| MO1O2.889 (S)                | MO1O2_889_S |
| MO1O3 (S)                    | MO1O3_S     |
| MO1O4SR1 (S)                 | MO1O4SR1_S  |
| MO2O8ZR1 (S)                 | MO2O8ZR1_S  |
| MO5RU3 (S)                   | MO5RU3_S    |
| MO1SI2 (S)                   | MO1SI2_S    |
| MO3SI1 (S)                   | MO3SI1_S    |
| MO1U2 (S)                    | MO1U2_S     |
| O3PU2 (S)                    | O3PU2_S     |
| O3.04PU2 (S)                 | O3_04PU2_S  |
| O2RU1 (S)                    | O2RU1_S     |
| O2SI1 (S) Cristobalite       | O2SI1_S1    |
| O2SI1 (S) Quartz_HT          | O2SI1_S2    |
| O2SI1 (S) Quartz_LT          | O2SI1_S3    |
| O2SI1 (S) Tridymite          | O2SI1_S4    |
| O3SI1SR1 (S)                 | O3SI1SR1_S  |
| O4SI1SR2 (S)                 | O4SI1SR2_S  |
| O5SI1SR3 (S)                 | O5SI1SR3_S  |

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|------------------------------|-------------|
| NTB name                     | TDB name    |
| O2SR1 (S)                    | O2SR1_S     |
| O4SR2ZR1 (S)                 | O4SR2ZR1_S  |
| O7SR3ZR2 (S)                 | O7SR3ZR2_S  |
| O3U1 (S)                     | O3U1_S      |
| O8U3 (S)                     | O8U3_S      |
| O9U4 (S)                     | O9U4_S      |
| PU1RU1 (S)                   | PU1RU1_S    |
| PU1RU2 (S)                   | PU1RU2_S    |
| PU3RU1 (S)                   | PU3RU1_S    |
| PU5RU3 (S)                   | PU5RU3_S    |
| PU19RU1 (S)                  | PU19RU1_S   |
| PU1SI1 (S)                   | PU1SI1_S    |
| PU1SI2 (S)                   | PU1SI2_S    |
| PU3SI2 (S)                   | PU3SI2_S    |
| PU3SI5 (S)                   | PU3SI5_S    |
| PU5SI3 (S)                   | PU5SI3_S    |
| RU1SI1 (S)                   | RU1SI1_S    |
| RU2SI1 (S)                   | RU2SI1_S    |
| RU2SI3 (S)                   | RU2SI3_S    |
| RU4SI3 (S)                   | RU4SI3_S    |
| RU5SI3 (S)                   | RU5SI3_S    |
| RU1U2 (S)                    | RU1U2_S     |
| RU4U3 (S)                    | RU4U3_S     |
| RU5U3 (S)                    | RU5U3_S     |
| RU12U13 (S) LT               | RU12U13_S1  |
| RU12U13 (S) HT               | RU12U13_S2  |
| RU1ZR1 (S)                   | RU1ZR1_S    |
| RU2ZR1 (S)                   | RU2ZR1_S    |
| SI1SR1 (S)                   | SI1SR1_S    |
| SI1SR2 (S)                   | SI1SR2_S    |
| SI2SR1 (S) LT                | SI2SR1_S    |
| SI3SR5 (S)                   | SI3SR5_S    |
| SI1U3 (S) HT                 | SI1U3_S1    |
| SI1U3 (S) LT                 | SI1U3_S2    |
| SI1.88U1 (S)                 | SI1_88U1_S  |
| SI3U1 (S)                    | SI3U1_S     |
| SI5U3 (S)                    | SI5U3_S     |
| SI511U489 (S)                | SI511U489_S |
| SI1ZR1 (S)                   | SI1ZR1_S    |
| SI1ZR2 (S)                   | SI1ZR2_S    |
| SI1ZR3 (S)                   | SI1ZR3_S    |
| SI2ZR1 (S)                   | SI2ZR1_S    |
| SI2ZR3 (S)                   | SI2ZR3_S    |
| SI3ZR5 (S)                   | SI3ZR5_S    |
| SI4ZR5 (S)                   | SI4ZR5_S    |

## 1.3 Condensed Solutions

| NTB name             | mult | atoms                                                   | TDB name            |
|----------------------|------|---------------------------------------------------------|---------------------|
| <b>ALPHA_Ce2O3</b>   | 1    | Ce, O                                                   | <b>ALPHA_Ce2O3</b>  |
| <b>ALPHA_Pu</b>      | 1    | Pu, Zr                                                  | <b>ALPHA_Pu</b>     |
| <b>BCC_A2</b>        | 3    | Ba, C, Ce, Cr, Fe, La, Mo, Pu, Ru, Si, Sr, U, Zr, O     | <b>BCC_A2</b>       |
| <b>BCT_U</b>         | 1    | C, U, O                                                 | <b>BCT_U</b>        |
| <b>BETA_Pu</b>       | 1    | Pu, U, Zr                                               | <b>BETA_Pu</b>      |
| <b>C2La_SS</b>       | 1    | C, La                                                   | <b>C2La_SS</b>      |
| <b>C3La2_SS</b>      | 1    | C, La                                                   | <b>C3La2_SS</b>     |
| <b>CC_La2O3</b>      | 1    | Ba, O, Ce, La, Sr, Zr                                   | <b>CC_La2O3</b>     |
| <b>CEMENTITE</b>     | 1    | C, Cr, Fe, Mo                                           | <b>CEMENTITE</b>    |
| <b>CORUNDUM</b>      | 2    | Cr, O, Fe, Zr                                           | <b>CORUNDUM</b>     |
| <b>Ce2O3_SS</b>      | 1    | Ce, O, Zr                                               | <b>Ce2O3_SS</b>     |
| <b>Cs2MoO4_SS</b>    | 1    | Ba, Mo, O, Cs                                           | <b>Cs2MoO4_SS</b>   |
| <b>DELTA_UZr2</b>    | 1    | U, Zr                                                   | <b>DELTA_UZr2</b>   |
| <b>DHCP</b>          | 1    | Ce, La                                                  | <b>DHCP</b>         |
| <b>DIA_A4</b>        | 1    | Ru, Si, Sr                                              | <b>DIA_A4</b>       |
| <b>DZETA_Pu</b>      | 1    | Pu, U, Zr                                               | <b>DZETA_Pu</b>     |
| <b>ETA_CMo</b>       | 1    | C, Mo                                                   | <b>ETA_CMo</b>      |
| <b>ETA_Pu</b>        | 1    | Pu, U, Zr                                               | <b>ETA_Pu</b>       |
| <b>FCC_A1</b>        | 2    | Ba, C, Ce, Cr, Fe, La, Mo, Pu, Ru, Si, Sr, U, Zr        | <b>FCC_A1</b>       |
| <b>FCC_B1</b>        | 2    | Ba, O, Fe, Sr                                           | <b>FCC_B1_SS12</b>  |
| <b>FCC_B1 (4)</b>    | 2    | C, Pu, U, Zr, O                                         | <b>FCC_B1_4</b>     |
| <b>FCC_C1</b>        | 2    | Ba, O, Ce, Cr, Fe, La, U, Sr, Pu, Zr                    | <b>FCC_C1</b>       |
| <b>FEM6_PuU</b>      | 1    | Fe, Pu, U                                               | <b>FEM6_PuU</b>     |
| <b>GAMMA_Pu</b>      | 1    | Pu, U, Zr                                               | <b>GAMMA_Pu</b>     |
| <b>HCP_A3</b>        | 2    | C, Ce, Cr, Fe, La, Mo, Pu, Ru, U, Zr, O                 | <b>HCP_A3</b>       |
| <b>KSI_CARBIDE</b>   | 1    | C, Fe, Mo                                               | <b>KSI_CARBIDE</b>  |
| <b>LAVES_C14</b>     | 1    | Cr, Zr                                                  | <b>LAVES_C14</b>    |
| <b>LAVES_C15 (1)</b> | 2    | Cr, Fe, Pu, U, Zr                                       | <b>LAVES_C15_1</b>  |
| <b>LAVES_C15 (2)</b> | 1    | Mo, Zr                                                  | <b>LAVES_C15_2</b>  |
| <b>LIQUID</b>        | 3    | Ba, O, Mo, C, Ce, Cr, Cs, Fe, La, Pu, Si, Sr, U, Zr, Ru | <b>LIQUID</b>       |
| <b>M23C6_CrFeMo</b>  | 1    | C, Cr, Fe, Mo                                           | <b>M23C6_CrFeMo</b> |
| <b>M2C3_PuU</b>      | 1    | C, Pu, U                                                | <b>M2C3_PuU</b>     |
| <b>M6C</b>           | 1    | C, Cr, Fe, Mo                                           | <b>M6C</b>          |
| <b>M7C3</b>          | 1    | C, Cr, Fe, Mo                                           | <b>M7C3</b>         |
| <b>MONOCLINIC</b>    | 1    | Ce, O, Pu, Zr                                           | <b>MONOCLINIC</b>   |
| <b>MU_FeMo</b>       | 1    | Fe, Mo                                                  | <b>MU_FeMo</b>      |
| <b>Mo5Si3_SS</b>     | 1    | Mo, Si                                                  | <b>Mo5Si3_SS</b>    |
| <b>ORT_A20</b>       | 1    | Fe, Pu, Si, U, Zr                                       | <b>ORT_A20</b>      |
| <b>PEROVSKITE</b>    | 2    | Ba, Mo, O, Pu, U, Zr, Sr                                | <b>PEROVSKITE</b>   |
| <b>PuO1.61_SS</b>    | 1    | O, Pu                                                   | <b>PuO1.61_SS</b>   |
| <b>R_FeMo</b>        | 1    | Fe, Mo                                                  | <b>R_FeMo</b>       |
| <b>Ru3U_SS</b>       | 1    | C, Ru, U                                                | <b>Ru3U_SS</b>      |

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|------------------------------|------|----------------------------------|----------------------|
| NTB name                     | mult | atoms                            | TDB name             |
| <b>SIGMA</b>                 | 1    | Cr, Fe, Mo                       | <b>SIGMA</b>         |
| <b>SPINEL</b>                | 1    | Cr, O, Fe                        | <b>SPINEL</b>        |
| <b>Si2Sr_SS_HT</b>           | 1    | Si, Sr                           | <b>Si2Sr_SS_HT</b>   |
| <b>Si2U3_SS</b>              | 1    | C, Si, U                         | <b>Si2U3_SS</b>      |
| <b>TCHERNOBYLITE</b>         | 1    | O, Si, U, Zr                     | <b>TCHERNOBYLITE</b> |
| <b>TET_A6</b>                | 1    | Pu, U, Zr                        | <b>TET_A6</b>        |
| <b>TET_METAL</b>             | 1    | Cr, Fe, Mo, Pu, Ru, Si, U, Zr    | <b>TET_METAL</b>     |
| <b>TET_OXIDE</b>             | 1    | Ba, O, Ce, Cr, Fe, La, Pu, U, Zr | <b>TET_OXIDE</b>     |
| <b>THETA_PuZr</b>            | 1    | Pu, Zr                           | <b>THETA_PuZr</b>    |

## 1.4 Gas

| NTB name               | TDB name        |
|------------------------|-----------------|
| <b>AR1 (G)</b>         | <b>AR</b>       |
| <b>BA1 (G)</b>         | <b>BA</b>       |
| <b>BA1H1 (G)</b>       | <b>BA1H1</b>    |
| <b>BA1H1O1 (G)</b>     | <b>BA1H1O1</b>  |
| <b>BA1H2O2 (G)</b>     | <b>BA1H2O2</b>  |
| <b>BA1MO1O4 (G)</b>    | <b>BA1MO1O4</b> |
| <b>BA1O1 (G)</b>       | <b>BA1O1</b>    |
| <b>BA2O1 (G)</b>       | <b>BA2O1</b>    |
| <b>C1 (G)</b>          | <b>C</b>        |
| <b>C2 (G)</b>          | <b>C2</b>       |
| <b>C3 (G)</b>          | <b>C3</b>       |
| <b>C4 (G)</b>          | <b>C4</b>       |
| <b>C5 (G)</b>          | <b>C5</b>       |
| <b>C6CR1O6 (G)</b>     | <b>C6CR1O6</b>  |
| <b>C5FE1O5 (G)</b>     | <b>C5FE1O5</b>  |
| <b>C1H1 (G)</b>        | <b>C1H1</b>     |
| <b>C1H2 (G)</b>        | <b>C1H2</b>     |
| <b>C1H3 (G)</b>        | <b>C1H3</b>     |
| <b>C1H4 (G)</b>        | <b>C1H4</b>     |
| <b>C2H1 (G)</b>        | <b>C2H1</b>     |
| <b>C2H2 (G)</b>        | <b>C2H2</b>     |
| <b>C2H3 (G)</b>        | <b>C2H3</b>     |
| <b>C2H4 (G)</b>        | <b>C2H4</b>     |
| <b>C2H5 (G)</b>        | <b>C2H5</b>     |
| <b>C2H6 (G)</b>        | <b>C2H6</b>     |
| <b>C3H4 (G) 1</b>      | <b>C3H4_1</b>   |
| <b>C3H4 (G) 2</b>      | <b>C3H4_2</b>   |
| <b>C3H4 (G) 3</b>      | <b>C3H4_3</b>   |
| <b>C3H6 (G) 1</b>      | <b>C3H6_1</b>   |
| <b>C3H6 (G) 2</b>      | <b>C3H6_2</b>   |
| <b>C3H7 (G) 1</b>      | <b>C3H7_1</b>   |
| <b>C3H7 (G) 2</b>      | <b>C3H7_2</b>   |
| <b>C3H8 (G)</b>        | <b>C3H8</b>     |
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|------------------------------|-----------|
| NTB name                     | TDB name  |
| C1H1O1 (G)                   | C1H1O1    |
| C1H1O2 (G)                   | C1H1O2    |
| C1H2O1 (G)                   | C1H2O1    |
| C1H2O2 (G) C                 | C1H2O2_1  |
| C1H2O2 (G) T                 | C1H2O2_2  |
| C1H3O1 (G) 1                 | C1H3O1_1  |
| C1H3O1 (G) 2                 | C1H3O1_2  |
| C1H4O1 (G)                   | C1H4O1    |
| C2H2O1 (G)                   | C2H2O1    |
| C2H2O2 (G)                   | C2H2O2    |
| C2H4O1 (G) 1                 | C2H4O1_1  |
| C2H4O1 (G) 2                 | C2H4O1_2  |
| C2H4O2 (G) 1                 | C2H4O2_1  |
| C2H4O2 (G) 2                 | C2H4O2_2  |
| C2H4O4 (G)                   | C2H4O4    |
| C2H6O1 (G) 1                 | C2H6O1_1  |
| C2H6O1 (G) 2                 | C2H6O1_2  |
| C2H6O2 (G)                   | C2H6O2    |
| C3H4O1 (G) 1                 | C3H4O1_1  |
| C3H4O1 (G) 2                 | C3H4O1_2  |
| C3H4O1 (G) 3                 | C3H4O1_3  |
| C3H4O2 (G) 1                 | C3H4O2_1  |
| C3H4O2 (G) 2                 | C3H4O2_2  |
| C3H4O3 (G)                   | C3H4O3    |
| C3H6O1 (G) 1                 | C3H6O1_1  |
| C3H6O1 (G) 2                 | C3H6O1_2  |
| C3H6O1 (G) 3                 | C3H6O1_3  |
| C3H6O1 (G) 4                 | C3H6O1_4  |
| C3H6O1 (G) 5                 | C3H6O1_5  |
| C3H6O2 (G)                   | C3H6O2    |
| C3H6O3 (G)                   | C3H6O3    |
| C3H8O1 (G) 1                 | C3H8O1_1  |
| C3H8O1 (G) 2                 | C3H8O1_2  |
| C3H8O1 (G) 3                 | C3H8O1_3  |
| C2H6O1SI1 (G)                | C2H6O1SI1 |
| C2H8SI1 (G)                  | C2H8SI1   |
| C6MO1O6 (G)                  | C6MO1O6   |
| C1O1 (G)                     | C1O1      |
| C1O2 (G)                     | C1O2      |
| C2O1 (G)                     | C2O1      |
| C3O2 (G)                     | C3O2      |
| C1SI1 (G)                    | C1SI1     |
| C1SI2 (G)                    | C1SI2     |
| C1SI3 (G)                    | C1SI3     |
| C1SI4 (G)                    | C1SI4     |
| C2SI1 (G)                    | C2SI1     |
| C2SI2 (G)                    | C2SI2     |

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|------------------------------|-----------------|
| NTB name                     | TDB name        |
| <b>C2SI3 (G)</b>             | <b>C2SI3</b>    |
| <b>CE1 (G)</b>               | <b>CE</b>       |
| <b>CE101 (G)</b>             | <b>CE101</b>    |
| <b>CR1 (G)</b>               | <b>CR</b>       |
| <b>CR2 (G)</b>               | <b>CR2</b>      |
| <b>CR101 (G)</b>             | <b>CR101</b>    |
| <b>CR102 (G)</b>             | <b>CR102</b>    |
| <b>CR103 (G)</b>             | <b>CR103</b>    |
| <b>CS1 (G)</b>               | <b>CS</b>       |
| <b>CS2 (G)</b>               | <b>CS2</b>      |
| <b>CS1H1 (G)</b>             | <b>CS1H1</b>    |
| <b>CS1H101 (G)</b>           | <b>CS1H101</b>  |
| <b>CS2H2O2 (G)</b>           | <b>CS2H2O2</b>  |
| <b>CS2MO104 (G)</b>          | <b>CS2MO104</b> |
| <b>CS101 (G)</b>             | <b>CS101</b>    |
| <b>CS201 (G)</b>             | <b>CS201</b>    |
| <b>CS202 (G)</b>             | <b>CS202</b>    |
| <b>CS204RU1 (G)</b>          | <b>CS204RU1</b> |
| <b>FE1 (G)</b>               | <b>FE</b>       |
| <b>FE2 (G)</b>               | <b>FE2</b>      |
| <b>FE1H2O2 (G)</b>           | <b>FE1H2O2</b>  |
| <b>FE101 (G)</b>             | <b>FE101</b>    |
| <b>H1 (G)</b>                | <b>H</b>        |
| <b>H2 (G)</b>                | <b>H2</b>       |
| <b>H1MO3 (G)</b>             | <b>H1MO3</b>    |
| <b>H1MO101 (G)</b>           | <b>H1MO101</b>  |
| <b>H2MO102 (G)</b>           | <b>H2MO102</b>  |
| <b>H2MO104 (G)</b>           | <b>H2MO104</b>  |
| <b>H101 (G)</b>              | <b>H101</b>     |
| <b>H102 (G)</b>              | <b>H102</b>     |
| <b>H201 (G)</b>              | <b>H201</b>     |
| <b>H202 (G)</b>              | <b>H202</b>     |
| <b>H101RU1 (G)</b>           | <b>H101RU1</b>  |
| <b>H202RU1 (G)</b>           | <b>H202RU1</b>  |
| <b>H203SI1 (G)</b>           | <b>H203SI1</b>  |
| <b>H4O4SI1 (G)</b>           | <b>H4O4SI1</b>  |
| <b>H101SR1 (G)</b>           | <b>H101SR1</b>  |
| <b>H202SR1 (G)</b>           | <b>H202SR1</b>  |
| <b>H1SI1 (G)</b>             | <b>H1SI1</b>    |
| <b>H2SI1 (G)</b>             | <b>H2SI1</b>    |
| <b>H3SI1 (G)</b>             | <b>H3SI1</b>    |
| <b>H4SI1 (G)</b>             | <b>H4SI1</b>    |
| <b>H6SI2 (G)</b>             | <b>H6SI2</b>    |
| <b>H1SR1 (G)</b>             | <b>H1SR1</b>    |
| <b>H1ZR1 (G)</b>             | <b>H1ZR1</b>    |
| <b>LA1 (G)</b>               | <b>LA</b>       |
| <b>LA101 (G)</b>             | <b>LA101</b>    |
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|------------------------------|---------------|
| NTB name                     | TDB name      |
| <b>LA201 (G)</b>             | <b>LA201</b>  |
| <b>LA202 (G)</b>             | <b>LA202</b>  |
| <b>MO1 (G)</b>               | <b>MO</b>     |
| <b>MO101 (G)</b>             | <b>MO101</b>  |
| <b>MO102 (G)</b>             | <b>MO102</b>  |
| <b>MO103 (G)</b>             | <b>MO103</b>  |
| <b>MO206 (G)</b>             | <b>MO206</b>  |
| <b>MO309 (G)</b>             | <b>MO309</b>  |
| <b>MO4012 (G)</b>            | <b>MO4012</b> |
| <b>MO5015 (G)</b>            | <b>MO5015</b> |
| <b>O1 (G)</b>                | <b>O</b>      |
| <b>O2 (G)</b>                | <b>O2</b>     |
| <b>O3 (G)</b>                | <b>O3</b>     |
| <b>O1PU1 (G)</b>             | <b>O1PU1</b>  |
| <b>O2PU1 (G)</b>             | <b>O2PU1</b>  |
| <b>O1RU1 (G)</b>             | <b>O1RU1</b>  |
| <b>O2RU1 (G)</b>             | <b>O2RU1</b>  |
| <b>O3RU1 (G)</b>             | <b>O3RU1</b>  |
| <b>O4RU1 (G)</b>             | <b>O4RU1</b>  |
| <b>O1SI1 (G)</b>             | <b>O1SI1</b>  |
| <b>O2SI1 (G)</b>             | <b>O2SI1</b>  |
| <b>O2SI2 (G)</b>             | <b>O2SI2</b>  |
| <b>O1SR1 (G)</b>             | <b>O1SR1</b>  |
| <b>O1U1 (G)</b>              | <b>O1U1</b>   |
| <b>O2U1 (G)</b>              | <b>O2U1</b>   |
| <b>O3U1 (G)</b>              | <b>O3U1</b>   |
| <b>O1ZR1 (G)</b>             | <b>O1ZR1</b>  |
| <b>O2ZR1 (G)</b>             | <b>O2ZR1</b>  |
| <b>PU1 (G)</b>               | <b>PU</b>     |
| <b>RU1 (G)</b>               | <b>RU</b>     |
| <b>SI1 (G)</b>               | <b>SI</b>     |
| <b>SI2 (G)</b>               | <b>SI2</b>    |
| <b>SI3 (G)</b>               | <b>SI3</b>    |
| <b>SR1 (G)</b>               | <b>SR</b>     |
| <b>SR2 (G)</b>               | <b>SR2</b>    |
| <b>U1 (G)</b>                | <b>U</b>      |
| <b>ZR1 (G)</b>               | <b>ZR</b>     |
| <b>ZR2 (G)</b>               | <b>ZR2</b>    |

## 2 Assessed Systems

### 2.1 Binary Systems

| assessed binary systems |         |         |         |         |         |         |
|-------------------------|---------|---------|---------|---------|---------|---------|
| Ba – C                  | Ba – Ce | Ba – Cr | Ba – Cs | Ba – Fe | Ba – La | Ba – Mo |
| Ba – O                  | Ba – Pu | Ba – Ru | Ba – Si | Ba – Sr | Ba – U  | Ba – Zr |
| C – Ce                  | C – Cr  | C – Cs  | C – Fe  | C – La  | C – Mo  | C – O   |
| C – Pu                  | C – Ru  | C – Si  | C – Sr  | C – U   | C – Zr  | Ce – Cr |
| Ce – Cs                 | Ce – Fe | Ce – La | Ce – Mo | Ce – O  | Ce – Pu | Ce – Ru |
| Ce – Si                 | Ce – Sr | Ce – U  | Ce – Zr | Cr – Cs | Cr – Fe | Cr – La |
| Cr – Mo                 | Cr – O  | Cr – Pu | Cr – Ru | Cr – Si | Cr – Sr | Cr – U  |
| Cr – Zr                 | Cs – Fe | Cs – La | Cs – Mo | Cs – O  | Cs – Pu | Cs – Ru |
| Cs – Si                 | Cs – Sr | Cs – U  | Cs – Zr | Fe – La | Fe – Mo | Fe – O  |
| Fe – Pu                 | Fe – Ru | Fe – Si | Fe – Sr | Fe – U  | Fe – Zr | La – Mo |
| La – O                  | La – Pu | La – Ru | La – Si | La – Sr | La – U  | La – Zr |
| Mo – O                  | Mo – Pu | Mo – Ru | Mo – Si | Mo – Sr | Mo – U  | Mo – Zr |
| O – Pu                  | O – Ru  | O – Si  | O – Sr  | O – U   | O – Zr  | Pu – Ru |
| Pu – Si                 | Pu – Sr | Pu – U  | Pu – 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                                                                  |
|-------------|---------------------------------------------------------------------------------------|
| Ba – Ce – O | BaO – CeO <sub>2</sub>                                                                |
| Ba – Cr – O | BaO – Cr <sub>2</sub> O <sub>3</sub>                                                  |
| Ba – Fe – O | BaO – FeO    BaO – Fe <sub>2</sub> O <sub>3</sub>                                     |
| Ba – La – O | BaO – La <sub>2</sub> O <sub>3</sub>                                                  |
| Ba – Mo – O | BaO – MoO <sub>3</sub>                                                                |
| Ba – O – Si | BaO – SiO <sub>2</sub>                                                                |
| Ba – O – Sr | BaO – SrO                                                                             |
| Ba – O – U  | BaO – UO <sub>2</sub>                                                                 |
| Ba – O – Zr | BaO – ZrO <sub>2</sub>                                                                |
| Ba – O – Pu | BaO – PuO <sub>2</sub>                                                                |
| C – Cr – Fe | full                                                                                  |
| C – Fe – Mo | full                                                                                  |
| C – O – U   | full                                                                                  |
| C – O – Zr  | full                                                                                  |
| C – O – Pu  | full                                                                                  |
| C – U – Zr  | full                                                                                  |
| C – U – Pu  | full                                                                                  |
| Ce – Cr – O | full                                                                                  |
| Ce – O – La | CeO <sub>2</sub> – La <sub>2</sub> O <sub>3</sub>                                     |
| Ce – O – Mo | CeO <sub>2</sub> – MoO <sub>3</sub> Ce <sub>2</sub> O <sub>3</sub> – MoO <sub>3</sub> |
| Ce – O – Pu | CeO <sub>2</sub> – PuO <sub>2</sub> Ce <sub>2</sub> O <sub>3</sub> – PuO <sub>2</sub> |
| Ce – O – Si | Ce <sub>2</sub> O <sub>3</sub> – SiO <sub>2</sub>                                     |
| Ce – O – Sr | CeO <sub>2</sub> – SrO                                                                |

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|------------------------------|------------------------------------------------------------------------------------------------------|
| system                       | assessed sub-systems                                                                                 |
| Ce – O – U                   | CeO <sub>2</sub> – UO <sub>2</sub> Ce <sub>2</sub> O <sub>3</sub> – UO <sub>2</sub>                  |
| Ce – O – Zr                  | CeO <sub>2</sub> – ZrO <sub>2</sub> Ce <sub>2</sub> O <sub>3</sub> – ZrO <sub>2</sub>                |
| Cr – Fe – O                  | full                                                                                                 |
| Cr – Fe – Zr                 | full                                                                                                 |
| Cr – La – O                  | Cr <sub>2</sub> O <sub>3</sub> – La <sub>2</sub> O <sub>3</sub>                                      |
| Cr – Mo – O                  | full                                                                                                 |
| Cr – O – Si                  | CrO – Cr <sub>2</sub> O <sub>3</sub> – SiO <sub>2</sub>                                              |
| Cr – O – Sr                  | Cr <sub>2</sub> O <sub>3</sub> – SrO                                                                 |
| Cr – O – U                   | Cr <sub>2</sub> O <sub>3</sub> – UO <sub>2</sub>                                                     |
| Cr – O – Zr                  | full                                                                                                 |
| Cs – Mo – O                  | Cs <sub>2</sub> MoO <sub>4</sub> – MoO <sub>3</sub>                                                  |
| Fe – La – O                  | FeO – La <sub>2</sub> O <sub>3</sub> Fe <sub>2</sub> O <sub>3</sub> – La <sub>2</sub> O <sub>3</sub> |
| Fe – O – Pu                  | full                                                                                                 |
| Fe – O – Si                  | FeO – Fe <sub>2</sub> O <sub>3</sub> – SiO <sub>2</sub>                                              |
| Fe – O – Sr                  | FeO – SrO    Fe <sub>2</sub> O <sub>3</sub> – SrO                                                    |
| Fe – O – U                   | full                                                                                                 |
| Fe – O – Zr                  | full                                                                                                 |
| Fe – Pu – U                  | full                                                                                                 |
| Fe – Pu – Zr                 | full                                                                                                 |
| Fe – U – Zr                  | full                                                                                                 |
| La – O – Pu                  | La <sub>2</sub> O <sub>3</sub> – PuO <sub>2</sub>                                                    |
| La – O – Si                  | La <sub>2</sub> O <sub>3</sub> – SiO <sub>2</sub>                                                    |
| La – O – Sr                  | La <sub>2</sub> O <sub>3</sub> – SrO                                                                 |
| La – O – U                   | La <sub>2</sub> O <sub>3</sub> – UO <sub>2</sub>                                                     |
| La – O – Zr                  | La <sub>2</sub> O <sub>3</sub> – ZrO <sub>2</sub>                                                    |
| Mo – O – Pu                  | MoO <sub>3</sub> – PuO <sub>2</sub>                                                                  |
| Mo – O – Zr                  | MoO <sub>3</sub> – ZrO <sub>2</sub>                                                                  |
| O – Pu – Si                  | SiO <sub>2</sub> – PuO <sub>2</sub>                                                                  |
| O – Pu – Sr                  | SrO – PuO <sub>2</sub>                                                                               |
| O – Pu – U                   | full                                                                                                 |
| O – Pu – Zr                  | full                                                                                                 |
| O – Si – Sr                  | SrO – SiO <sub>2</sub>                                                                               |
| O – Si – U                   | SiO <sub>2</sub> – UO <sub>2</sub>                                                                   |
| O – Si – Zr                  | SiO <sub>2</sub> – ZrO <sub>2</sub>                                                                  |
| O – Sr – U                   | SrO – UO <sub>2</sub>                                                                                |
| O – Sr – Zr                  | SrO – ZrO <sub>2</sub>                                                                               |
| O – U – Zr                   | full                                                                                                 |
| Pu – U – Zr                  | full                                                                                                 |

## 2.3 Quaternary Systems

| system           | assessed sub-systems                                  |
|------------------|-------------------------------------------------------|
| Ba – Cs – Mo – O | BaMoO <sub>4</sub> – Cs <sub>2</sub> MoO <sub>4</sub> |
| O – Si – U – Zr  | SiO <sub>2</sub> – UO <sub>2</sub> – ZrO <sub>2</sub> |