

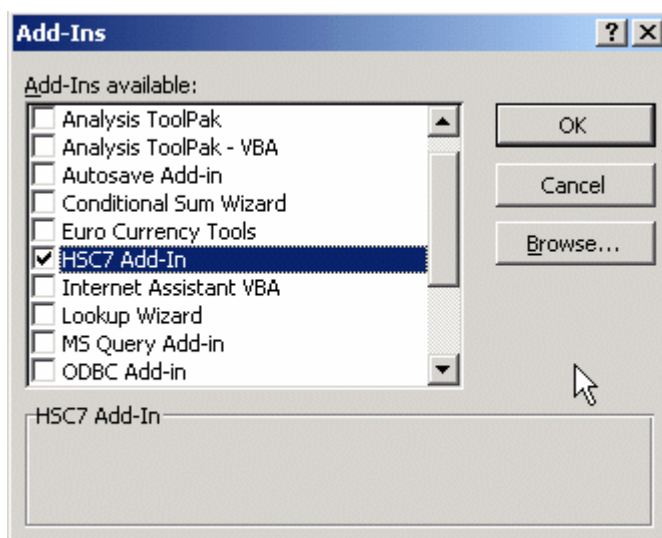
## 27. Excel Add-In Functions

### 27.1 Getting started

With HSC 7.0 Add-In Functions it is possible to use the HSC 7.0 database directly under Microsoft Excel and in that way carry out several thermochemical and other type of calculations. In order to use these functions in Excel they must, however, first be activated. Three stages may be needed to activate HSC functions in Excel. The number of stages needed depends on the computer settings and Windows and Excel versions.

#### Activation Stage 1:

1. Open Excel 2000 (NOTE: HSC Add-Ins may not work under earlier Excel versions!)
2. Select “**Tools, Add-Ins...**” from the menu.
3. Select “**Browse...**” and locate **HSC7.XLL** from your **HSC7\AddIns** folder.
4. Select “**HSC 7.0 Functions**” and press “**OK**”, see Figure 1. It may be necessary to restart Excel in order for the add-in functions to work.



**Figure 1:** Adding/removing HSC 7.0 Functions under Excel *Please do NOT select old HSC 6 Functions!*

#### Activation Stage 2 (Optional):

If the installation is unsuccessful, the following steps may help:

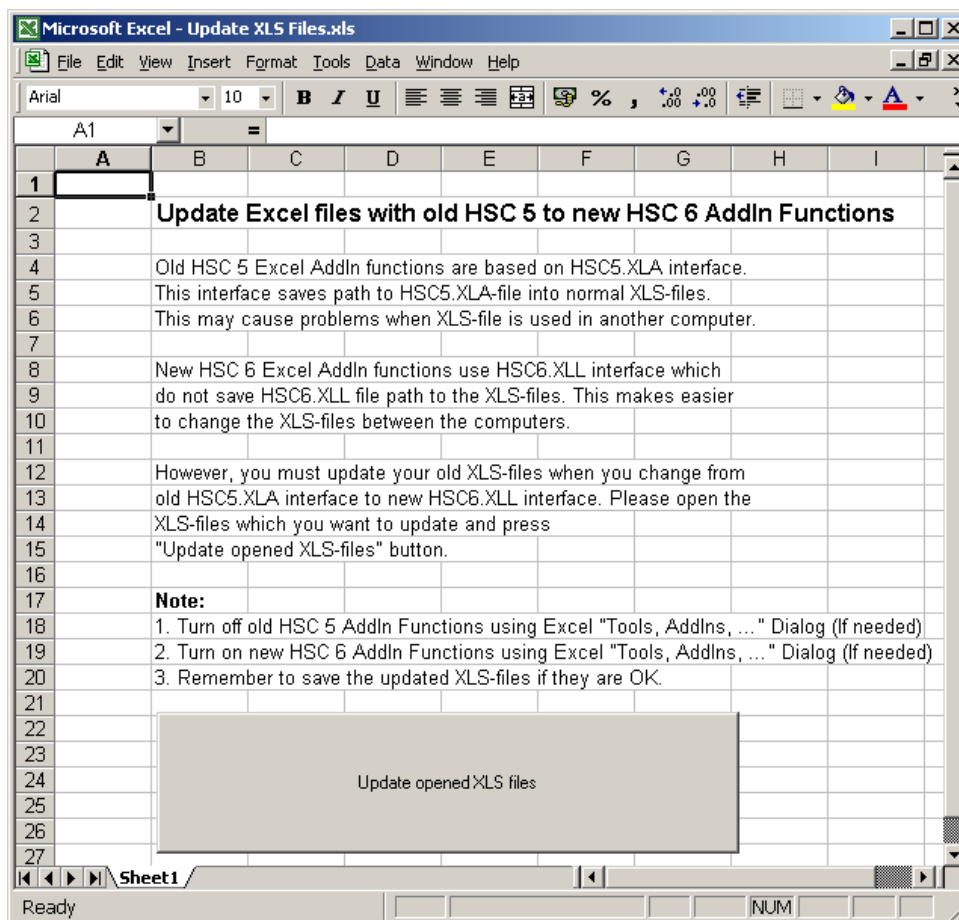
1. Start the VBA Editor by pressing Alt+F11.  
(or select Tools, Macro, Visual Basic Editor, ...)
2. Select “**Tools, References**” from the menu.
3. Select “**Browse...**” and locate **HSC7.XLL** from your HSC directory (for example C:\HSC7\HSC7.XLL). It may be necessary to restart Excel in order for the add-in functions to work. HSC Add-In functions locate in HSC7.DLL, however, Excel calls these functions through HSC7.XLL interface.
4. See also stage 3 in Chapter 27.2 if needed.

The HSC installation routine automatically takes care of the HSC7.DLL registration.

**Activation Stage 3 (Optional):**

1. During opening, answer **No** when prompted by Excel to update all linked information (automatic link updates do not work due to some bug in MS Excel).
2. Select **“Edit, Links”** from the menu.
3. Choose the path containing **HSC7.XLL** from the listbox and press **“Change Source”**.
4. Browse to your **HSC7\AddIns** folder and choose **HSC7.XLL**.

**27.2 Updating XLS-Files which use old HSC 5.1 Add-In Functions**



**Figure 2:** Update XLS Files.xls macro may be used to update old Excel files with HSC 5.1 Add-In functions to HSC 6.0 or 7.0 Add-Ins.

You must update old Excel files with HSC 5.1 Add-In functions. If you find following type formulas from your Excel spreadsheet then you must update:

=‘C:\HSC5\AddIns\_BackUp\HSC5.xla!’H(D11;E11)

HSC 5.1 use old HSC5.XLA interface, HSC 6.0 or 7.0 Add-Ins use better HSC7.XLL interface which makes the use of these files much more easier because the path to the HSC7.XLL files is not saved into the XLS-file cells!

### 27.3 Brief Description of the Functions

The "AddInSample.xls" sample file offers the fastest way to start using HSC 7 Add-In functions, you may find it from HSC 7 folder, such as:

C:\HSC7\AddIns\AddInSample.xls

The add-in functions are used the same way as functions in general under MS Excel. For example by writing "**=H(A1;A2)**" the enthalpy for the species in cell A1 and at the temperature in cell A2, is returned. To view all existing functions simply select "**Insert, Function**" from the main menu and then choose "**User Defined**" from the left listbox. The right listbox will now give show all available HSC functions and their arguments. A complete description of the functions is given in the following tables 1 and 2.

A useful Excel example file is located in the catalogue "\AddIns" in your HSC installation directory. The example, called "AddInSample.xls", can be viewed after the add-ins have been made available (described in Chapter 27.1). Figure 3 shows what the example file should look like using MS Excel 2000.

The functions are all collected in the column "Function" and their return values under "Return value". A red font indicates the input values with a short description of every function shown to the right. This example provides an easy method for testing the functions and also provides practice in learning how to use them.

| HSC Add-In Functions - Species Based |   |
|--------------------------------------|---|
| Functions                            | Descriptions (Return values)  |
| <b>General</b>                       |   |
| <b>Description (Return value):</b>   |   |
| UNITS(T;E)                           | Changes the temperature and energy units  |
| BAL(Equation)                        | Balanced reaction equation  |
| SPECIES(DBNo,Position)               | Species formula in given database and record number                                 |
| <b>Species</b>                       |   |
| <b>Description (Return value):</b>   |   |
| H(Species;T)                         | Enthalpy (per kmol) of species at given temperature                                 |
| HKG(Species;T)                       | Enthalpy (per kg) of species at given temperature                                   |
| HNM3 or HCM(Species;T)               | Enthalpy (per Nm <sup>3</sup> ) of species at given temperature                     |
| HLAT(Species;T)                      | Enthalpy excluding phase transformations (per mol) of species at given temperature  |
| S(Species;T)                         | Entropy (per Mmol) of species at given temperature                                  |
| CP(Species;T)                        | Heat capacity (per Mmol) of species at given temperature                            |
| G(Species;T)                         | Gibbs energy (per kmol) of species at given temperature                             |
| <b>Reaction equation</b>             |   |
| <b>Description (Return value):</b>   |   |
| H(Equation;T)                        | Enthalpy difference (per kmol) of reaction equation at given temperature.           |
| HKG(Equation;T)                      | Enthalpy difference (per kg) of reaction equation at given temperature              |
| S(Equation;T)                        | Entropy difference (per Mmol) of reaction equation at given temperature             |
| CP(Equation;T)                       | Heat capacity difference (per Mmol) of reaction equation at given temperature       |
| G(Equation;T)                        | Gibbs energy difference (per kmol) of reaction equation at given temperature        |
| K(Equation;T)                        | Equilibrium constant of reaction equation at given temperature                      |
| <b>Iteration (reverse)</b>           |   |
| <b>Description (Return value):</b>   |   |
| TATH(Species;H)                      | Temperature of species at given enthalpy (per kmol)                                 |
| TATHKG(Species;H)                    | Temperature of species at given enthalpy (per kg)                                   |
| TATHNM3 or TATHCM(Species;H)         | Temperature of species at given enthalpy (per Nm <sup>3</sup> )                     |
| TATHLAT(Species;H)                   | Temperature of species (per kmol) at given enthalpy excluding phase transformations |
| TATS(Species;S)                      | Temperature of species at given entropy (per Mmol).                                 |
| TATCP(Species;CP)                    | Temperature of species at given heat capacity (per Mmol)                            |
| TATG(Species;G)                      | Temperature of species at given Gibbs energy (per kmol)                             |
| <b>Temp. independent</b>             |   |
| <b>Description (Return value):</b>   |   |
| STRUCT(Species)                      | Structural formula of given species   |
| CHNAME(Species)                      | Chemical name of given species  |
| CONAME(Species)                      | Common name of given species  |
| CAN(Species)                         | Chemical abstract number of given species   |
| MW(Species)                          | Molecular weight of given species [kg/kmol]   |
| DE(Species)                          | Density of given species [kg/l]   |
| MP(Species)                          | Melting point of given species  |
| BP(Species)                          | Boiling point of given species  |
| PHASE(Species)                       | Phase type of given species   |
| RGBCOLOR(Species)                    | RGB color code of given species   |
| REF(Species)                         | Reference of given species  |
| REL(Species)                         | Reliability class of given species  |
| <b>Percentage</b>                    |   |
| <b>Description (Return value):</b>   |   |
| MOLP(Species1;Species2)              | Species 1 content in Species 2 in mol-%   |
| WTP(Species1;Species2)               | Species 1 content in Species 2 in wt-%  |
| <b>CP-function related</b>           |   |
| <b>Description (Return value):</b>   |   |
| CPFUNCTION(Species)                  | Heat capacity (Cp) polynomial function of given species                             |
| CPA(Species)                         | A coefficient in Cp-function of given species                                       |
| CPB(Species)                         | B coefficient in Cp-function of given species                                       |
| CPC(Species)                         | C coefficient in Cp-function of given species                                       |
| CPD(Species)                         | D coefficient in Cp-function of given species                                       |
| TMIN(Species)                        | Lower limit of Cp-function temperature range  |
| TMAX(Species)                        | Upper limit of Cp-function temperature range  |

Table 1: Description of all currently available HSC Species based add-in functions.

| HSC Add-In Functions - Stream Based  |   |
|--|---|
| Functions  | Descriptions (Return values)  |
| <b>Stream/Flow</b>   | <b>Description (Return value):</b>  |
| STREAMH(Species;Amount;T)<br>FLOWH(Species;Amount;T)                             | Enthalpy of the specified stream/flow (species in kmol) at given temperature  |
| STREAMHKG(Species;Amount;T)<br>FLOWHKG(Species;Amount;T)                         | Enthalpy of the specified stream/flow (species in kg) at given temperature  |
| STREAMHNM3(Species;Amount;T)<br>FLOWHNM3(Species;Amount;T)                       | Enthalpy of the specified stream/flow (species in Nm3) at given temperature   |
| STREAMHLAT(Species;Amount;T)<br>FLOWHLAT(Species;Amount;T)                       | Enthalpy excluding phase transformations of the specified stream/flow (species in kmol) at given temperature  |
| STREAMS(Species;Amount;T)<br>FLOWS(Species;Amount;T)                             | Entropy of specified stream/flow (species in Mmol) at given temperature   |
| STREAMCP(Species;Amount;T)<br>FLOWCP(Species;Amount;T)                           | Heat capacity of specified stream/flow (species in Mmol) at given temperature   |
| STREAMG(Species;Amount;T)<br>FLOWG(Species;Amount;T)                             | Gibbs energy of specified stream/flow (species in kmol) at given temperature  |
| DensityA(Species;Amount;T)   | Density of aqueous solution (kg/m3)<br>Arg. 2 = Weight fractions, max = 1, Arg. 3 = temperature °C  |
| <b>Stream/Flow iteration (reverse)</b>   | <b>Description (Return value):</b>  |
| STREAMTH(Species;Amount;H;Tmin;TMax)<br>FLOWTH(Species;Amount;H;Tmin;TMax)       | Temperature of stream/flow (species in kmol) at given enthalpy between Tmin and Tmax<br>Outside range returns #VALUE!                                 |
| STREAMTHKG(Species;Amount;H;Tmin;TMax)<br>FLOWTHKG(Species;Amount;H;Tmin;TMax)   | Temperature of stream/flow (species in kg) at given enthalpy between Tmin and Tmax<br>Outside range returns #VALUE!                                   |
| STREAMTHNM3(Species;Amount;H;Tmin;TMax)<br>FLOWTHNM3(Species;Amount;H;Tmin;TMax) | Temperature of stream/flow (species in Nm3) at given enthalpy between Tmin and Tmax<br>Outside range returns #VALUE!                                  |
| STREAMTHLAT(Species;Amount;H;Tmin;TMax)<br>FLOWTHLAT(Species;Amount;H;Tmin;TMax) | Temperature of stream/flow (species in kmol) at given enthalpy excluding phase transformations between Tmin and Tmax<br>Outside range returns #VALUE! |
| STREAMTS(Species;Amount;S;Tmin;TMax)<br>FLOWTS(Species;Amount;S;Tmin;TMax)       | Temperature of stream/flow (species in Mmol) at given entropy between Tmin and Tmax<br>Outside range returns #VALUE!                                  |
| STREAMTCP(Species;Amount;CP;Tmin;TMax)<br>FLOWTH(Species;Amount;H;Tmin;TMax)     | Temperature of stream/flow (species in Mmol) at given heat capacity between Tmin and Tmax<br>Outside range returns #VALUE!                            |
| STREAMTG(Species;Amount;G;Tmin;TMax)<br>FLOWTG(Species;Amount;G;Tmin;TMax)       | Temperature of stream/flow (species in kmol) at given gibbs energy between Tmin and Tmax<br>Outside range returns #VALUE!                             |
| <b>Equilibrium Compositions</b>  | <b>Description (Return value):</b>  |
| StreamEQ(Species;Input;Output, T, P)   | Equilibrium amounts of species based on given amounts, temperature and pressure.  |

Table 2: Description of all currently available HSC Stream based add-in functions.

| Microsoft Excel - AddInSample.xls                   |   |                     |                          |               |               |               |               |
|---|---|---------------------|--------------------------|---------------|---------------|---------------|---------------|
| File Edit View Insert Format Tools Data Window Help |   |                     |                          |               |               |               |               |
| Times New Roman 10 B I U % ; +.0 +.00               |   |                     |                          |               |               |               |               |
| B107 =  |   |                     |                          |               |               |               |               |
| A   | B                                       | C                   | D                        | E             | F             | G             | H             |
| 18  | <b>Reaction equation</b>                | <b>Return Value</b> | <b>Argument 1</b>        | <b>Arg. 2</b> | <b>Arg. 3</b> | <b>Arg. 4</b> | <b>Arg. 5</b> |
| 19  | H(Equation;T)                           | -485.132            | 2H2(g) + O2(g) = 2H2O(g) | 100           |               |               |               |
| 20  | HKG(Equation;T)                         | -13.465             | 2H2(g) + O2(g) = 2H2O(g) | 100           |               |               |               |
| 21  | S(Equation;T)                           | -93.276             | 2H2(g) + O2(g) = 2H2O(g) | 100           |               |               |               |
| 22  | CP(Equation;T)                          | -19.295             | 2H2(g) + O2(g) = 2H2O(g) | 100           |               |               |               |
| 23  | G(Equation;T)                           | -450.326            | 2H2(g) + O2(g) = 2H2O(g) | 100           |               |               |               |
| 24  | K(Equation;T)                           | 1.105E+63           | 2H2(g) + O2(g) = 2H2O(g) | 100           |               |               |               |
| 25  | <b>Iteration (reverse)</b>              | <b>Return Value</b> | <b>Argument 1</b>        | <b>Arg. 2</b> | <b>Arg. 3</b> | <b>Arg. 4</b> | <b>Arg. 5</b> |
| 26  | TATH(Species;H)                         | 5046.97             | CO2(g)                   | -93.35        |               |               |               |
| 27  | TATHKG(Species;H)                       | 1191.85             | FeS                      | -0.26         |               |               |               |
| 28  | TATHNM3 or TATHCM(Species;H)            | 42.94               | N2(g)                    | 0.02          |               |               |               |
| 29  | TATHLAT(Species;H)                      | 25.00               | H2O(l)                   | 0.00          |               |               |               |
| 30  | TATS(Species;S)                         | -138.85             | H2O(l)                   | 20.77         |               |               |               |
| 31  | TATCP(Species;CP)                       | 137.99              | CH4(a)                   | 49.04         |               |               |               |
| 32  | TATG(Species;G)                         | -204.93             | He(g)                    | -11.29        |               |               |               |
| 33  | <b>Stream/Flow</b>                      | <b>Return Value</b> | <b>Argument 1</b>        | <b>Arg. 2</b> | <b>Arg. 3</b> | <b>Arg. 4</b> | <b>Arg. 5</b> |
| 34  | STREAMH(Species;Amount;T)               | 5.723               | Fe                       | 1             | 100           |               |               |
| 35  | FLOWH(Species;Amount;T)                 |                     | Cu                       | 1             |               |               |               |
| 36  |   |                     | Zn                       | 1             |               |               |               |
| 37  | STREAMHKG(Species;Amount;T)             | 6.364               | Cu(+2a)                  | 21.85         | 100           |               |               |
| 38  | FLOWHKG(Species;Amount;T)               |                     | Fe(+2a)                  | 6.72          |               |               |               |
| 39  |   |                     | Zn(+2a)                  | 2             |               |               |               |
| 40  | STREAMHNM3(Species;Amount;T)            | 2.187               | N2(g)                    | 17.78         | 100           |               |               |
| 41  | FLOWHNM3(Species;Amount;T)              |                     | O2(g)                    | 4.79          |               |               |               |
| 42  |   |                     | Ar(g)                    | 0.23          |               |               |               |
| 43  | STREAMHLAT(Species;Amount;T)            | 14.060              | Cu2S                     | 1             | 100           |               |               |
| 44  | FLOWHLAT(Species;Amount;T)              |                     | FeS                      | 1             |               |               |               |
| 45  |   |                     | ZnS                      | 1             |               |               |               |
| 46  | STREAMS(Species;Amount;T)               | 200.629             | N2(g)                    | 0.78          | 100           |               |               |
| 47  | FLAWS(Species;Amount;T)                 |                     | O2(g)                    | 0.21          |               |               |               |
| 48  |   |                     | Ar(g)                    | 0.01          |               |               |               |
| 49  | STREAMCP(Species;Amount;T)              | 29.252              | N2(g)                    | 0.78          | 100           |               |               |
| 50  | FLOWCP(Species;Amount;T)                |                     | O2(g)                    | 0.21          |               |               |               |
| 51  |   |                     | Ar(g)                    | 0.01          |               |               |               |
| 52  | STREAMG(Species;Amount;T)               | -72.677             | N2(g)                    | 0.78          | 100           |               |               |
| 53  | FLOWG(Species;Amount;T)                 |                     | O2(g)                    | 0.21          |               |               |               |
| 54  |   |                     | Ar(g)                    | 0.01          |               |               |               |
| 55  | DensityA(Species;Amount;T)              | 1260.348            | NaCl                     | 0.2           | 50            |               |               |
| 56  |   |                     | FeSO4                    | 0.1           |               |               |               |
| 57  |   |                     |                          |               |               |               |               |
| 58  | <b>Stream/Flow iteration (reverse)</b>  | <b>Return Value</b> | <b>Argument 1</b>        | <b>Arg. 2</b> | <b>Arg. 3</b> | <b>Arg. 4</b> | <b>Arg. 5</b> |
| 59  | STREAMTH(Species;Amount;H;Tmin;TMax)    | 100.00              | Fe                       | 1             | 5.72          | 0             | 1000          |
| 60  | FLOWTH(Species;Amount;H;Tmin;TMax)      |                     | Cu                       | 1             |               |               |               |
| 61  |   |                     | Zn                       | 1             |               |               |               |
| 62  | STREAMTHKG(Species;Amount;H;Tmin;TMax)  | 100.00              | Cu(+2a)                  | 21.85         | 6.36          | 0             | 1000          |
| 63  | FLOWTHKG(Species;Amount;H;Tmin;TMax)    |                     | Fe(+2a)                  | 6.72          |               |               |               |
| 64  |   |                     | Zn(+2a)                  | 2             |               |               |               |
| 65  | STREAMTHNM3(Species;Amount;H;Tmin;TMax) | 100.00              | N2(g)                    | 17.77905      | 2.19          | 0             | 1000          |
| 66  | FLOWTHNM3(Species;Amount;H;Tmin;TMax)   |                     | O2(g)                    | 4.786145      |               |               |               |
| 67  |   |                     | Ar(g)                    | 0.227884      |               |               |               |
| 68  | STREAMTHLAT(Species;Amount;H;Tmin;TMax) | 100.00              | Cu2S                     | 1             | 14.06         | 0             | 1000          |
| 69  | FLOWTHLAT(Species;Amount;H;Tmin;TMax)   |                     | FeS                      | 1             |               |               |               |
| 70  |   |                     | ZnS                      | 1             |               |               |               |
| 71  | STREAMTS(Species;Amount;S;Tmin;TMax)    | 100.00              | N2(g)                    | 0.78          | 200.63        | 0             | 1000          |
| 72  | FLOWTS(Species;Amount;S;Tmin;TMax)      |                     | O2(g)                    | 0.21          |               |               |               |
| 73  |   |                     | Ar(g)                    | 0.01          |               |               |               |
| 74  | STREAMTCP(Species;Amount;CP;Tmin;TMax)  | 100.00              | N2(g)                    | 0.78          | 29.25         | 0             | 1000          |
| 75  | FLOWTH(Species;Amount;H;Tmin;TMax)      |                     | O2(g)                    | 0.21          |               |               |               |
| 76  |   |                     | Ar(g)                    | 0.01          |               |               |               |
| 77  | STREAMTG(Species;Amount;G;Tmin;TMax)    | 100.00              | N2(g)                    | 0.78          | -72.68        | 0             | 1000          |
| 78  | FLOWTG(Species;Amount;G;Tmin;TMax)      |                     | O2(g)                    | 0.21          |               |               |               |
| 79  |   |                     | Ar(g)                    | 0.01          |               |               |               |

Figure 3: Example including all available Excel add-in functions (AddInSample.xls).

## 27.4 Stream Equilibrium Function (Array Functions)

The array functions are created in different way than normal spreadsheet functions. The most important array function of HSC-Sim is **StreamEQ** which calculates the amounts of species in the equilibrium state at given temperature and pressure.

|    | A                 | B            | C             | D   | E |
|----|-------------------|--------------|---------------|-----|---|
| 1  | Temperature       |              | 1500 °C       |     |   |
| 2  | Pressure          |              | 1 bar         |     |   |
| 3  | <b>SPECIES:</b>   | <b>Input</b> | <b>Output</b> |     |   |
| 4  | <b>§ PHASE 1:</b> | 25           |               | °C  |   |
| 5  | CO(g)             | 0            |               | mol |   |
| 6  | CO2(g)            |              |               | mol |   |
| 7  | N(g)              |              |               | mol |   |
| 8  | N2(g)             | 3.02         |               | mol |   |
| 9  | NO(g)             |              |               | mol |   |
| 10 | N2O3(g)           |              |               | mol |   |
| 11 | N2O4(g)           |              |               | mol |   |
| 12 | N2O5(g)           |              |               | mol |   |
| 13 | O2(g)             | 0.8          |               | mol |   |
| 14 | <b>§ PHASE 2:</b> | 25           |               | °C  |   |
| 15 | C                 | 1            |               | mol |   |
| 16 |                   |              |               |     |   |

Fig. 4. Selection for array function.

You may create array function in MS Excel and HSC-Sim using the same procedure:

1. Create continuous list of phases and species in one column. Important: The phase name string must always start with §-character, Fig. 4.
2. Specify temperatures of the phases into the next column on the §-phase-row.
3. Specify the input amounts (moles) of the species into the next column.
4. Select array function cell range, see Fig. 4.
5. Type array function: =StreamEQ(A4:A15;B4:B15;C1;C2), Fig. 5.
6. Keep Ctrl + Shift keys down and press Enter, Fig. 6.
7. The array function is ready if it is within brackets, Fig. 6.

Please note that the array function cell range must be continuous, it is like a solid and fixed block within spreadsheet. Do not brake off this cell range with uncontinuous copy-paste, insert rows, delete rows, etc. operations.

| SUM |                   |              |               |           |   |
|-----|-------------------|--------------|---------------|-----------|---|
|     | A                 | B            | C             | D         | E |
| 1   | Temperature       |              | 1500          | °C        |   |
| 2   | Pressure          |              | 1             | bar       |   |
| 3   | <b>SPECIES:</b>   | <b>Input</b> | <b>Output</b> |           |   |
| 4   | <b>§ PHASE 1:</b> | <b>25</b>    | <b>C1;C2)</b> | <b>°C</b> |   |
| 5   | CO(g)             | 0            |               | mol       |   |
| 6   | CO2(g)            |              |               | mol       |   |
| 7   | N(g)              |              |               | mol       |   |
| 8   | N2(g)             | 3.02         |               | mol       |   |
| 9   | NO(g)             |              |               | mol       |   |
| 10  | N2O3(g)           |              |               | mol       |   |
| 11  | N2O4(g)           |              |               | mol       |   |
| 12  | N2O5(g)           |              |               | mol       |   |
| 13  | O2(g)             | 0.8          |               | mol       |   |
| 14  | <b>§ PHASE 2:</b> | <b>25</b>    |               | <b>°C</b> |   |
| 15  | C                 | 1            |               | mol       |   |
| 16  |                   |              |               |           |   |

Fig. 5. Type array function.

| C4 |                   |              |               |           |   |
|----|-------------------|--------------|---------------|-----------|---|
|    | A                 | B            | C             | D         | E |
| 1  | Temperature       |              | 1500          | °C        |   |
| 2  | Pressure          |              | 1             | bar       |   |
| 3  | <b>SPECIES:</b>   | <b>Input</b> | <b>Output</b> |           |   |
| 4  | <b>§ PHASE 1:</b> | <b>25</b>    | <b>1500</b>   | <b>°C</b> |   |
| 5  | CO(g)             | 0            | 0.400008      | mol       |   |
| 6  | CO2(g)            |              | 0.599992      | mol       |   |
| 7  | N(g)              |              | 7.841E-11     | mol       |   |
| 8  | N2(g)             | 3.02         | 3.0199962     | mol       |   |
| 9  | NO(g)             |              | 7.531E-06     | mol       |   |
| 10 | N2O3(g)           |              | 4.736E-23     | mol       |   |
| 11 | N2O4(g)           |              | 2.878E-30     | mol       |   |
| 12 | N2O5(g)           |              | 1.32E-36      | mol       |   |
| 13 | O2(g)             | 0.8          | 2.171E-07     | mol       |   |
| 14 | <b>§ PHASE 2:</b> | <b>25</b>    | <b>1500</b>   | <b>°C</b> |   |
| 15 | C                 | 1            | 0             | mol       |   |
| 16 |                   |              |               |           |   |

Fig. 6. Keep Ctrl + Shift keys down and press Enter.

## 27.5 Using the MineralProperty Add-In function

The add-in provides the MineralProperty Function. This function accesses the HSC Mineral Database (...HSC7\Geo\System\HscGeo7.mdb) and enables you to query the properties of the stored minerals.

The format for the formula is MineralProperty(<MineralName>, <PropertyName>).

As with any Excel functions you can use references and other formulas to provide the two parameters to the MineralProperty function, e.g MineralProperty(A1,B1), MineralProperty("Pyrite",B1) and so on. See the example workbook MineralProperty\_examples.xls for more samples and information:

### Available functions

The HSC add-in provides the following functions to facilitate access to the mineral properties.

| Function                 | Parameters  | Description   |
|--------------------------|---|---|
| =MineralC(MN, EL)        | MN=mineral name or mineral symbol<br>EL=element abbreviation                                  | Returns the weight-% of the specified element I the mineral   |
| =MineralCode(MN)         | MN=mineral name or mineral symbol   | returns the mineral symbol for the specified mineral  |
| =MineralColor(MN)        | MN=mineral name or mineral symbol   | Returns the color for the specified mineral   |
| =MineralDensity(MN)      | MN=mineral name or mineral symbol   | Returns the density for the specified mineral   |
| =MineralElementWt(MN;EL) | MN=mineral name<br>EL=element abbreviation  | See: MineralC   |
| =MineralFormula(MN)      | MN=mineral name or mineral symbol   | Returns the chemical formula of the specified mineral   |
| =MineralHardness(MN)     | MN=mineral name or mineral symbol   | Returns the hardness for the specified mineral  |
| =MineralLuster(MN)       | MN=mineral name   | Returns the luster for the specified mineral  |
| =MineralName(MN)         | MN=Mineral symbol or mineral name   | Returns the mineral name for the mineral specified symbol   |
| =MineralProperty(MN;PR)  | MN=mineral name or mineral symbol<br>PR=property name (field name in <Mineralchemistry table) | returns any of the fields in the <MineralChemistry table for the specified mineral. See: section: Mineralproperty |
| =MineralSG(MN)           | MN=mineral name or mineral symbol   | Returns the specific gravity (density) for the specified mineral  |

## MineralProperty

The MineralProperty function can be used to fetch the data from the fields in the <Mineralchemistry and Minerals tables for a given mineral. The available fields are listed below:

| Data field        | Explanation   | Example   |
|-------------------|---|---|
| Code              | The mineral symbol (ie. abbreviation)   | =mineralproperty("Pyrite";"code")                                 |
| Formula           | Chemical formula of the mineral   | =mineralproperty("Pyrite";"formula")                              |
| Density           |   | =mineralproperty("Pyrite";"density")                              |
| Hardness          |   | =mineralproperty("Pyrite";"hardness")                             |
| Color             |   | =mineralproperty("Pyrite";"color")                                |
| Luster            |   | =mineralproperty("Pyrite";"luster")                               |
| Group             |   | =mineralproperty("Pyrite";"group")                                |
| Chemical elements | These are returned in elemental form, not as oxides. Sampling location or [stoichiometric] if the mineral has been entered form               | =mineralproperty("Pyrite";"Fe")<br>=mineralproperty("Pyrite";"S") |
| Location          | chemical formula and not actually assayed   | =mineralproperty("Pyrite";"location")                             |
| ID                | The database ID of the mineral  | =mineralproperty("Pyrite";"ID")                                   |
| Elements          | A backslash delimited string representing the individual elements comprising the mineral in the format, e.g. \Si\O\                           | =mineralproperty("Pyrite";"elements")                             |
| Database          | The database in which the mineral has been stored. Usually HSC but depending on the actual use it can take any other value. Use with caution. | =mineralproperty("Pyrite";"database")                             |

A sample excel sheet using the features of the add-in

Microsoft Excel - AddInSample\_Mineral\_HSC7.xls

File Edit View Insert Format Tools Data Window HSC Help Adobe PDF

D8    =MineralFormula(D7)

1

2 **Example of using HSC Chemistry Add-Inn functions to create a table of minerals**

3 Periti Lamberg, 6.7.2009, HSC Chemistry 7.0

|          | Mineral 1          | Mineral 2          | Mineral 3          | Mineral 4          | Mineral 3          |
|----------|--------------------|--------------------|--------------------|--------------------|--------------------|
| Mineral  | Pyrite             | Py                 | PyPyha             | 13988              | 13988              |
| Code     | Py                 | Py                 | Py                 | Py                 | Py                 |
| Formula  | FeS2               | FeS2               | FeS2               | FeS2               | FeS2               |
| Name     | Pyrite             | Pyrite             | Pyrite             | Pyrite             | Pyrite             |
| Cu       | 0.00               | 0.00               | 0.05               | 0.05               | 0.05               |
| Zn       | 0.00               | 0.00               | 0.00               | 0.00               | 0.00               |
| Fe       | 46.55              | 46.55              | 46.69              | 46.69              | 46.69              |
| S        | 53.45              | 53.45              | 53.47              | 53.47              | 53.47              |
| Density  | 5.01               | 5.01               | 5.01               | 5.01               | 5.01               |
| Hardness | 6.5                | 6.5                | 6.5                | 6.5                | 6.5                |
| Color    | yellow, pale brass | yellow, pale brass | yellow, pale brass | yellow, pale brass | yellow, pale brass |
| Luster   | Metallic           | Metallic           | Metallic           | Metallic           | Metallic           |
| Group    |                    |                    |                    |                    |                    |
| Location | [stoichiometric]   | [stoichiometric]   | Pyhäsaalmi         | Pyhäsaalmi         | Pyhäsaalmi         |
| ID       | 66                 | 66                 | 13988              | 13988              | 13988              |
| Elements | FeS2               | FeS2               | FeS2               | FeS2               | FeS2               |
| Database | HSC                | HSC                | HSC                | HSC                | HSC                |

HSC Command      Code example

=MineralCode(B4)      =MineralCode("Pyrite")

=MineralFormula(B5)      =MineralFormula("G")

=MineralName(B7)      =MineralName("C")

=MineralC(B4;A8)      =MineralC("Pyrite";"E")

=MineralC(B\$6;\$A11)      =MineralC("Galena")

=MineralC(B\$6;\$A12)      =MineralC("Py";"S")

=MineralC(B\$6;\$A13)      =MineralC("Kds";"AI")

=MineralProperty(B\$6;\$A14)

General HSC Command **MineralProperty(Mineral)** returns the property of given mineral. Property can be any of the following

- Code
- Formula
- Density
- Hardness
- Color
- Luster
- Group
- and any of the chemical elements (e.g. Cu, Zn, Pb) but in elemental form, not in oxide form (e.g. Si, N)
- Location
- ID
- Elements
- Database

This column is copy paste-special-values from the D-column to check the commands

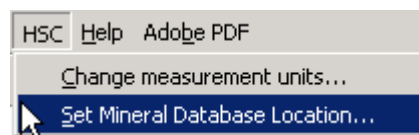
You can get mineral properties by using

- Mineral name (e.g. Pyrite)
- Mineral Code (returns the mineral name abbreviation, e.g. Py)
- Mineral Code (or Name) AND (part of the) Location (e.g. Py/Pyha) (Returns the first matching)
- Mineral ID (e.g. 1134) (Returns the mineral with ID-number)
- Mineral Location

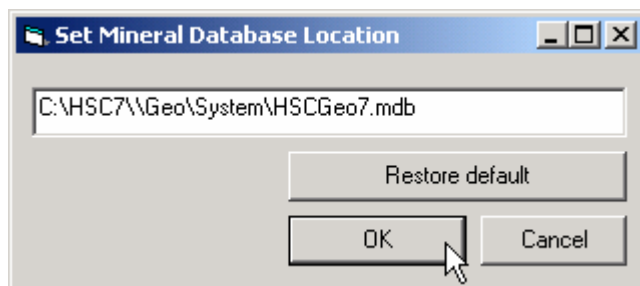
### Changing HSC Mineral database in MS Excel

It is possible to use common mineral database within a network instead of default option where all have separate mineral databases locally installed in the computers. To use common database do the following:

1. Copy the database file ...\\HSC7\\Geo\\System\\HscGeo7.mdb to a server where all users have access
2. In MS Excel select from the menu HSC – Set mineral database location



3. Type the location of the common database and press OK



4. To reset the database location back to the default one (...\HSC7\Geo\System\HscGeo7.mdb) press Restore default
5. To use other than default mineral database in all the programs open

## 27.6 HSC AddIn Functions

Some of the AddIn functions are available on in HSC Chemistry spreadsheets but not in MS Excel. Currently the StreamX is such a function:

|              |   |
|--------------|---|
| Function     | <b>StreamX</b>  |
| Syntax       | StreamX(StremName;ParticlesRange;Variable)  |
| Examples     | StreamX(E\$6;\$E\$56:\$E\$97;\$B8)<br>StreamX("ROM";\$E\$56:\$E\$97;"SiO2")   |
| Explanation  | Returns the value of the variable, e.g. SiO2 content of the stream calculated according to particles. Note that particle data can be corrected to be in harmony with chemical and mineral composition of the bulk feed. |
| Applications | StreamX functions is used in Mineral Based Models   |

Other HSC AddIn functions are StreamX, **RecoveryX**, **ParticleRecX**, **FractionX**, **MineralX**. These are described in more details in chapter "57. Mineral Based Models".

## 27.7 More about registering DLL Files

The HSC 7.0 installation routine should take care of all necessary DLL registrations. When selecting/deselecting the HSC 7.0 add-in using Excel, HSC7.DLL is automatically registered/unregistered. However, it is also possible to register/unregister the HSC7.DLL file manually. The program to achieve this is called Regsvr32.exe\*) and registration is completed using the following method:

Note: For other HSC6 installation paths than C:\HSC6, simply use your path instead in the instructions below.

1. Select “**Start, Run...**” from the Windows menu.
2. Type “**regsvr32 C:\HSC7\HSC7.dll**” for registering HSC 6.0 add-in functions.

Alternatively it can be achieved using the following method:

1. Double-click the file “**HSC7.DLL**” in your HSC directory.
2. If the file is *not* registered automatically, which is indicated by an “**Open With**”-dialog box, choose “**Other...**” in the dialog window.
3. Select “**Regsvr32.exe**” from your Windows System directory. Now double-click the file again and it should register automatically.

When unregistering files follow the same procedure, but add the /u switch before the file name, i.e. “**regsvr32 /u C:\HSC7\HSC7.DLL**” for unregistering HSC7.dll.

### \*Description of Regsvr32.exe

To add .ocx and certain .dll files, it will be necessary to run REGSVR32.EXE from the Run option in the Start menu. The following are the commands and switches needed:  
*regsvr32 [/u] [/s] [/n] [/i [:cmdline]] dll name or ocx name*

*/u* (unregistered server)

*/s* (silent; display no message boxes)

*/c* (console output)

*/i* Call dll or ocx install passing it an optional [cmdline];

when used with /u calls dll or ocx uninstall

*/n* Do not call dll RegisterServer; this option must be used with /I