30. Excel Add-In Functions

30.1. Getting started

With HSC Add-In functions it is possible to use the HSC database directly under Microsoft Excel 97 - 2013 and in that way carry out several thermochemical and other types of calculations. In order to use these functions in Excel they must, however, first be activated. The steps required to activate the Add-In functions might vary in different versions of Excel. The following shows the steps for Excel 2013.

Implementing Add-In functions in Excel 2013

1. Open Excel
2. Select **File – Options**

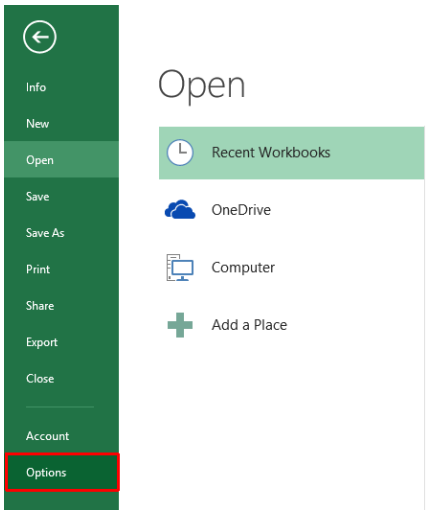


Fig. 1. Location of Options in Excel 2013.

3. Select **Add-Ins**

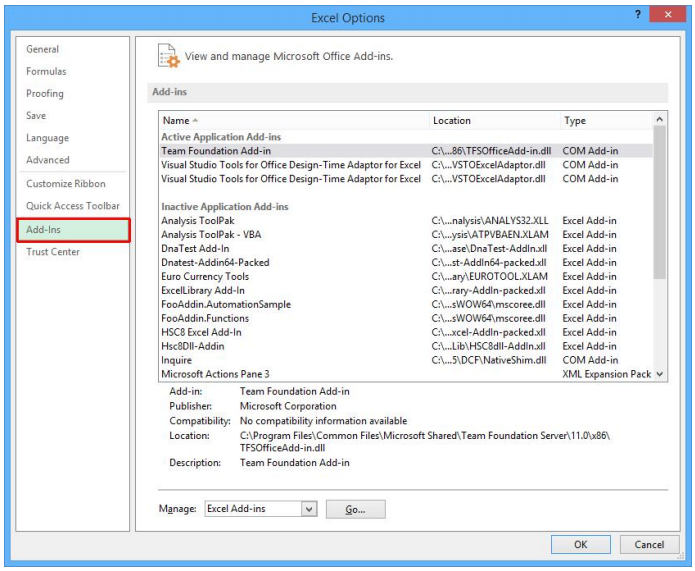


Fig. 2. Location of Add-Ins in Excel 2013.

4. Select **Excel Add-Ins** and click **Go…**

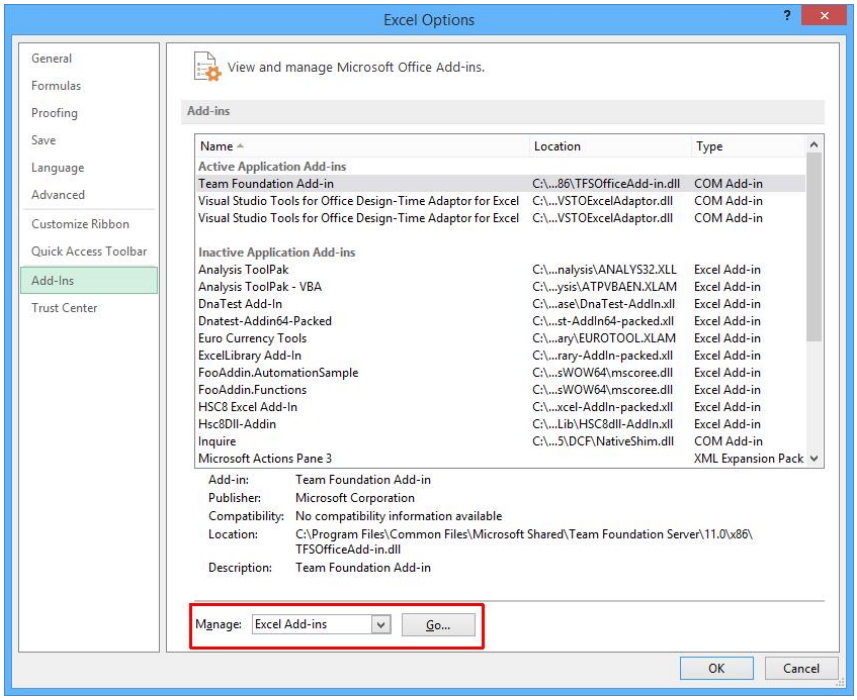


Fig. 3. Location of Add-ins Go…button in Excel 2013.

5. Select **Browse…** and locate HSC8-Excel.xll (or HSC8-Excel64.xll if you are using 64-bit Excel) from your HSC8\Programs folder.

6. See that “HSC8-Excel.xll” is selected and click **OK**.

30.2. Updating XLS files which use old HSC 7 Add-In functions

1. Turn off the old HSC7 Add-in Functions using Excel "**File – Options – AddIns**" dialog
2. Turn on the new HSC8 Add-in Functions using Excel "**File – Options – AddIns**" dialog
3. Remember to save the updated XLS file.

30.3. Brief description of the functions

The " AddInSample.xls" sample file offers the fastest way to start using HSC Add-In functions. You can find it in the HSC folder as:

C:\HSC8\AddIns\AddInSample.xls

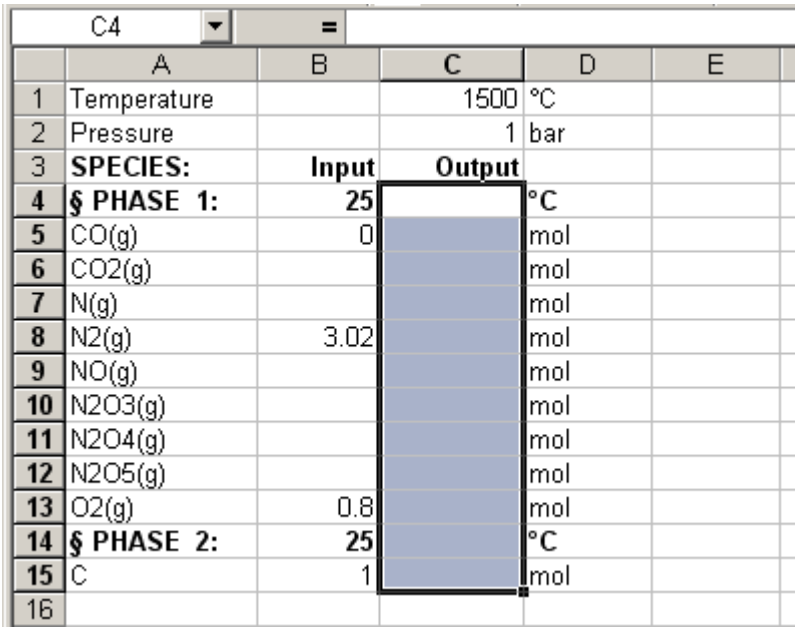
The Add-In functions are used in the same way as functions in general under MS Excel. For example, by writing **“=H(A1;A2)”** the enthalpy for the species in cell A1 and at the temperature in cell A2, is returned. To view all existing functions, simply select **“Insert, Function”** from the main menu and then choose the **“HSC8 Excel Add-In”** category. The list will now show all the available HSC functions.

A useful Excel example file is located in the catalog “\AddIns” in your HSC installation directory. The example, called “AddInSample.xls”, can be viewed after the Add-Ins have been made available (described in section 30.1).

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 on the right. This example provides an easy method for testing the functions and also provides practice in learning how to use them.

30.4. Stream Equilibrium function (Array functions)

The array functions are created differently 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 a given temperature and pressure.



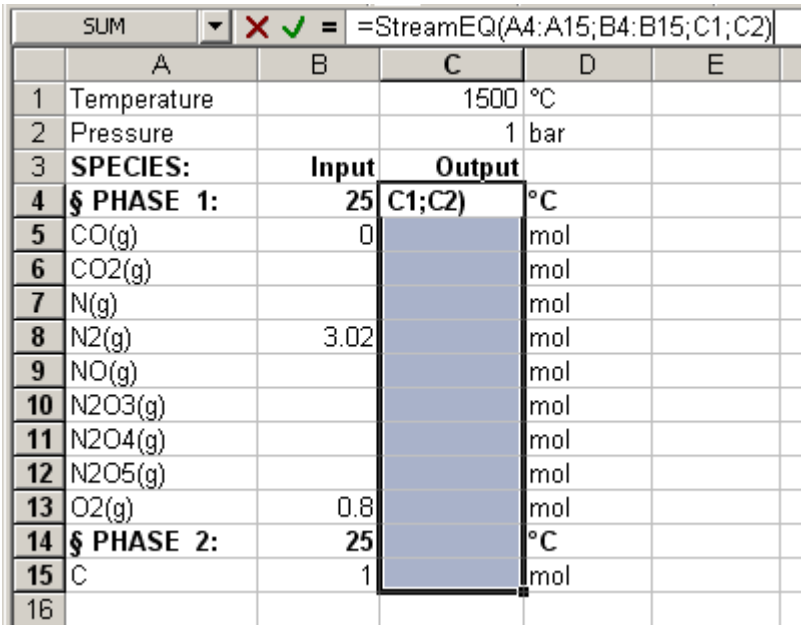
	A	B	C	D	E
1	Temperature		1500	°C	
2	Pressure		1	bar	
3	**SPECIES:**	**Input**	**Output**		
4	**§ PHASE 1:**	**25**		**°C**	
5	CO(g)	0		mol	
6	CO2(g)			mol	
7	N(g)			mol	
8	N2(g)	3.02		mol	
9	NO(g)			mol	
10	N2O3(g)			mol	
11	N2O4(g)			mol	
12	N2O5(g)			mol	
13	O2(g)	0.8		mol	
14	**§ PHASE 2:**	**25**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

Fig. 4. Selection for array function.

You can create an array function in MS Excel and HSC Sim using the same procedure:

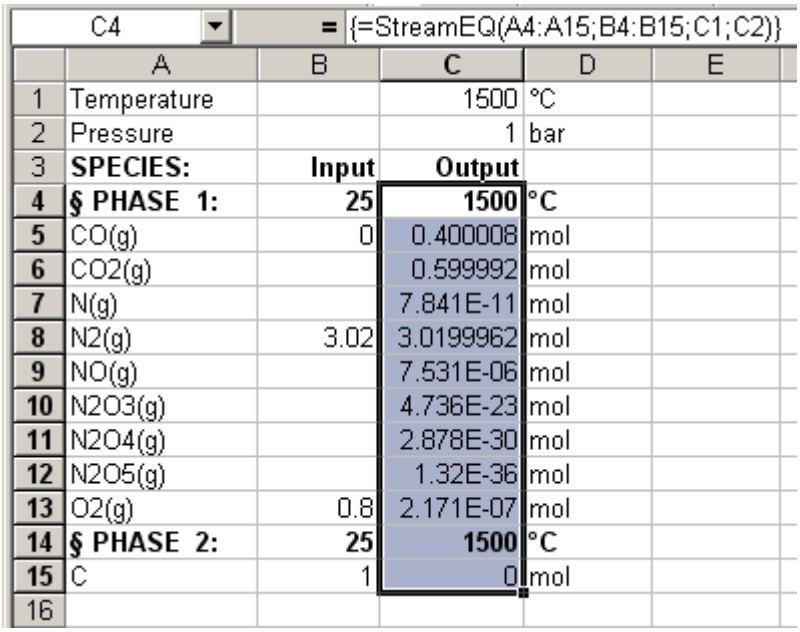
1. Create a continuous list of phases and species in one column. N.B! The phase name string must always start with **§**, see **Fig. 4**.
2. Specify the temperatures of the phases in the next column on the § phase row.
3. Specify the input amounts (moles) of the species in the next column.
4. Select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

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



SUM	=StreamEQ(A4:A15;B4:B15;C1;C2)			
	A	B	C	D	E
1	Temperature		1500	°C	
2	Pressure		1	bar	
3	**SPECIES:**	**Input**	**Output**		
4	**§ PHASE 1:**	**25**	**C1;C2)**	**°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	**§ PHASE 2:**	**25**		**°C**	
15	C	1		mol	
16					

Fig. 5. Type the array function.



C4	{=StreamEQ(A4:A15;B4:B15;C1;C2)}			
	A	B	C	D	E
1	Temperature		1500	°C	
2	Pressure		1	bar	
3	**SPECIES:**	**Input**	**Output**		
4	**§ PHASE 1:**	**25**	**1500**	**°C**	
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	**§ PHASE 2:**	**25**	**1500**	**°C**	
15	C	1	0	mol	
16					

Fig. 6. Hold down the Crtl + Shift keys and press Enter.

30.5. Using the MineralProperty Add-In function

The Add-In provides the MineralProperty function, which accesses the HSC Mineral Database 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 formulae to provide the two parameters for the MineralProperty function, e.g. MineralProperty(A1,B1), MineralProperty("Pyrite",B1) and so on. See the example workbook ..\AddIns\AddInSample_Mineral.xls for more examples 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 EL=element abbreviation	Returns the weight % of the specified element in 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 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 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	Mineral symbol (i.e. 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.	=mineralproperty("Pyrite";"Fe") =mineralproperty("Pyrite";"S")
Location	Sampling location or [stoichiometric] if the mineral has been entered from the chemical formula and not actually assayed	=mineralproperty("Pyrite";"location")
ID	Database ID of the mineral	=mineralproperty("Pyrite";"ID")
Elements	Backslash-delimited string represents the individual elements comprising the mineral in the format, e.g. \Si\O\	=mineralproperty("Pyrite";"elements")
Database	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")

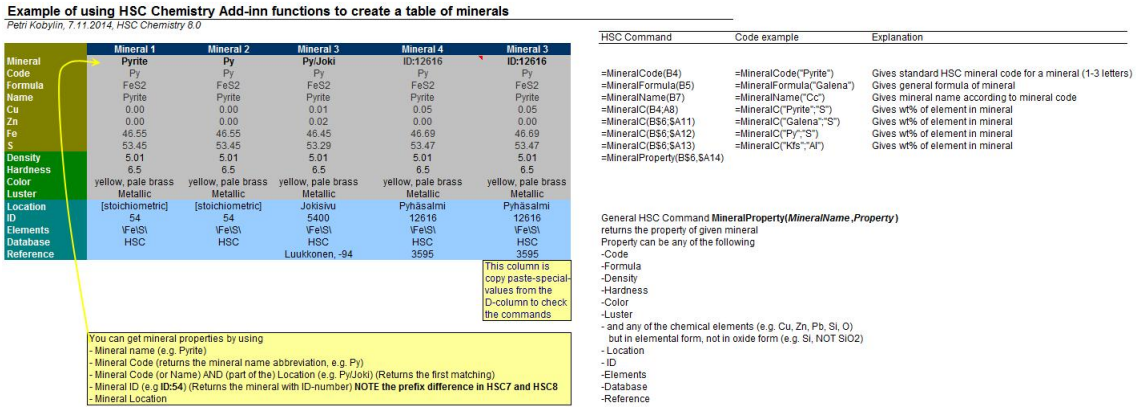


Fig. 7. A sample Excel sheet using the features of the Add-In.

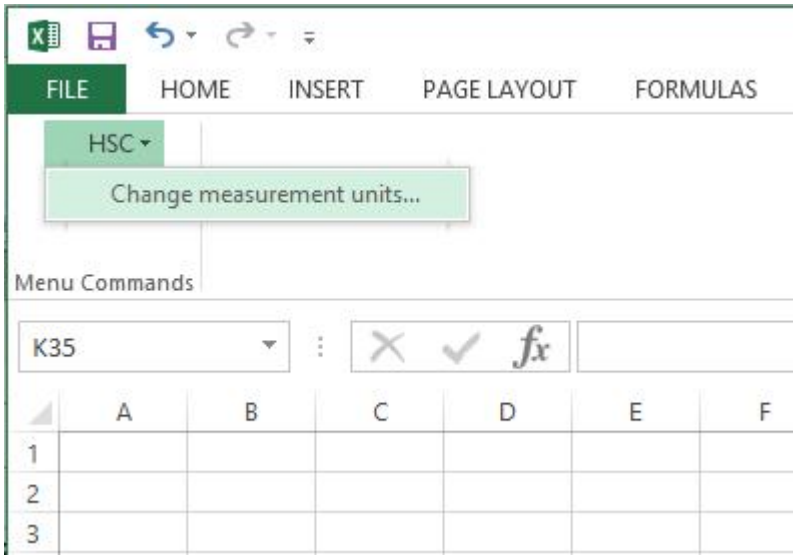
30.6. HSC AddIn functions

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

Function	**StreamX**
Syntax	StreamX(StreamName;ParticlesRange;Variable)
Examples	StreamX(E$6;$E$56:$E$97;$B8) 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 the chemical and mineral composition of the bulk feed.
Applications	StreamX functions are used in Mineral Based Models

Other HSC AddIn functions are **StreamX**, **RecoveryX, ParticleRecX, FractionX, MineralX**.

30.7. Changing measurement units



The user may change the default energy, temperature and pressure measurement units using the “Change measurement units…” dialog. The HSC menu can be accessed from the ADD-INS tab (Excel 2013).

After changing the measurement units, the workbook is automatically recalculated.

30.8. Changing Databases

You can change databases by using the DB (H, S and Cp Database) or Geo (Mineral Database) programs. For more information, please refer to Chapter 28 - HSC Databases.