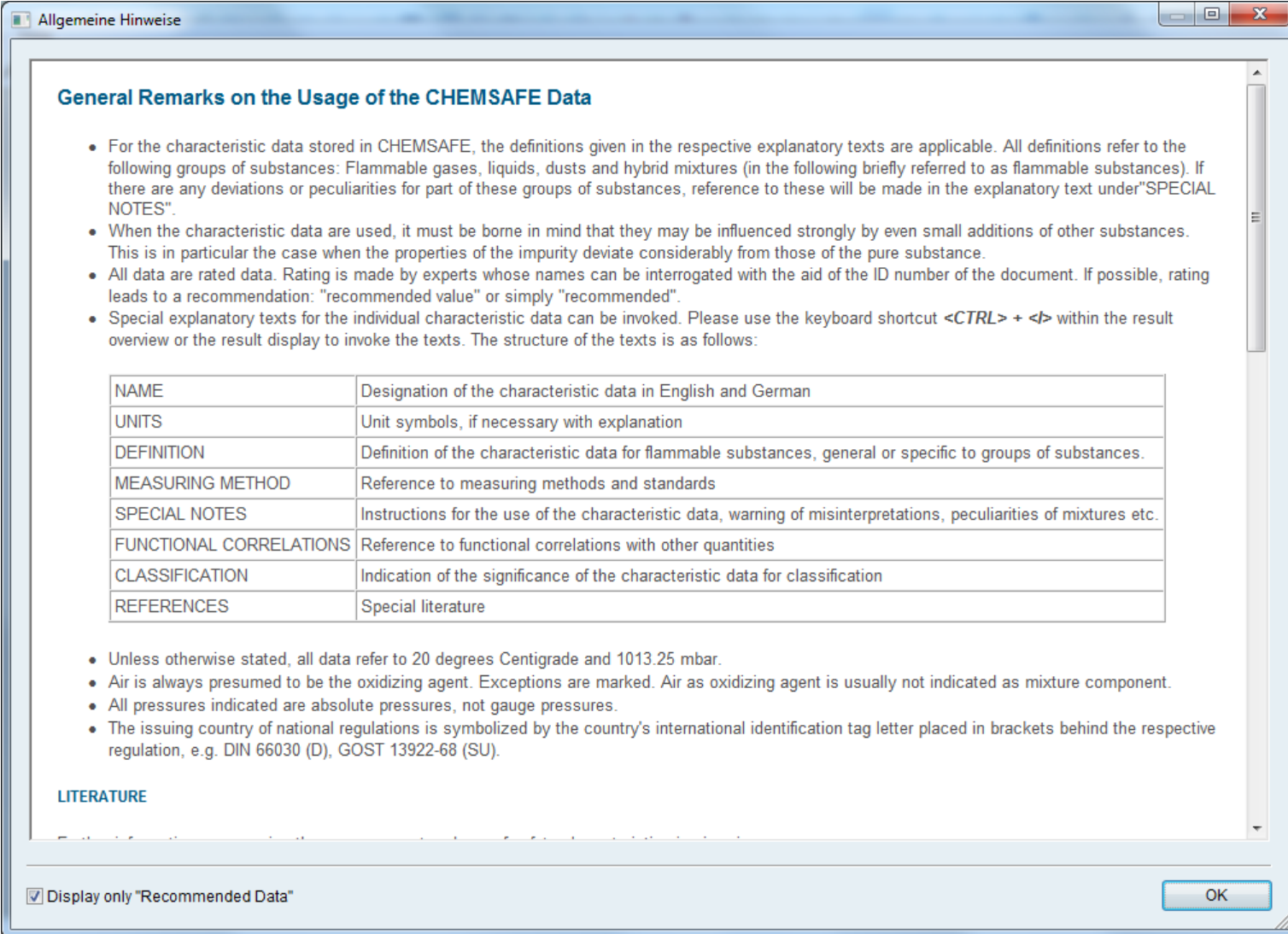




# CHEMSAFE in Action ...

Overview on the look and feel of CHEMSAFE

# 1<sup>st</sup> step: Usage notes



**General Remarks on the Usage of the CHEMSAFE Data**

- For the characteristic data stored in CHEMSAFE, the definitions given in the respective explanatory texts are applicable. All definitions refer to the following groups of substances: Flammable gases, liquids, dusts and hybrid mixtures (in the following briefly referred to as flammable substances). If there are any deviations or peculiarities for part of these groups of substances, reference to these will be made in the explanatory text under "SPECIAL NOTES".
- When the characteristic data are used, it must be borne in mind that they may be influenced strongly by even small additions of other substances. This is in particular the case when the properties of the impurity deviate considerably from those of the pure substance.
- All data are rated data. Rating is made by experts whose names can be interrogated with the aid of the ID number of the document. If possible, rating leads to a recommendation: "recommended value" or simply "recommended".
- Special explanatory texts for the individual characteristic data can be invoked. Please use the keyboard shortcut <CTRL> + </> within the result overview or the result display to invoke the texts. The structure of the texts is as follows:

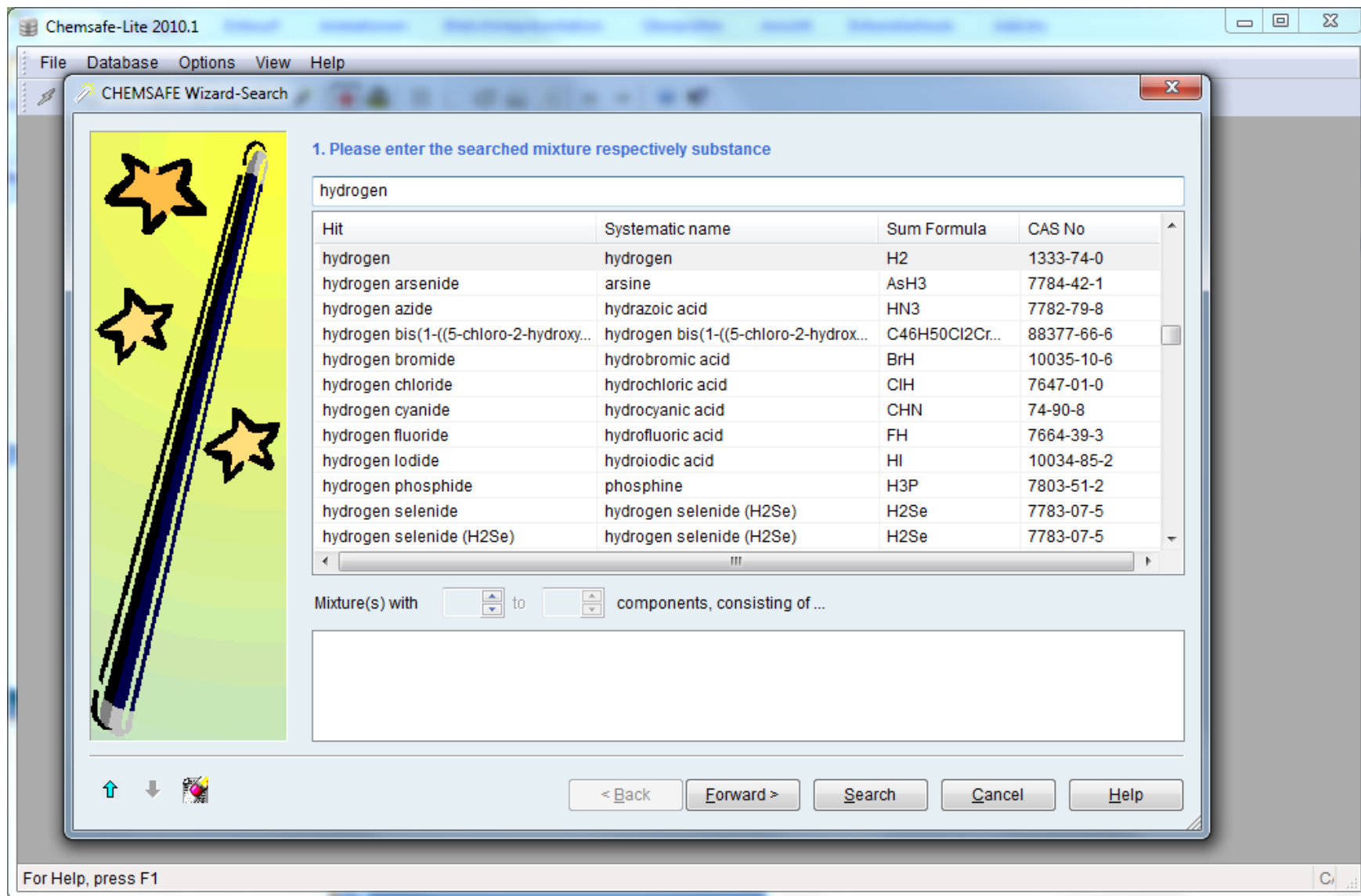
NAME	Designation of the characteristic data in English and German
UNITS	Unit symbols, if necessary with explanation
DEFINITION	Definition of the characteristic data for flammable substances, general or specific to groups of substances.
MEASURING METHOD	Reference to measuring methods and standards
SPECIAL NOTES	Instructions for the use of the characteristic data, warning of misinterpretations, peculiarities of mixtures etc.
FUNCTIONAL CORRELATIONS	Reference to functional correlations with other quantities
CLASSIFICATION	Indication of the significance of the characteristic data for classification
REFERENCES	Special literature

- Unless otherwise stated, all data refer to 20 degrees Centigrade and 1013.25 mbar.
- Air is always presumed to be the oxidizing agent. Exceptions are marked. Air as oxidizing agent is usually not indicated as mixture component.
- All pressures indicated are absolute pressures, not gauge pressures.
- The issuing country of national regulations is symbolized by the country's international identification tag letter placed in brackets behind the respective regulation, e.g. DIN 66030 (D), GOST 13922-68 (SU).

**LITERATURE**

Display only "Recommended Data" OK

# Wizard-Search: Identification of component(s)




The screenshot shows the Chemsafe-Lite 2010.1 Wizard-Search window. The search term 'hydrogen' is entered in the search box. The results table lists various hydrogen compounds with their systematic names, sum formulas, and CAS numbers. The window also features a navigation pane on the left with a pencil icon and three stars, and a bottom bar with navigation buttons and a help message.

1. Please enter the searched mixture respectively substance

hydrogen

Hit	Systematic name	Sum Formula	CAS No
hydrogen	hydrogen	H2	1333-74-0
hydrogen arsenide	arsine	AsH3	7784-42-1
hydrogen azide	hydrazoic acid	HN3	7782-79-8
hydrogen bis(1-((5-chloro-2-hydroxy...	hydrogen bis(1-((5-chloro-2-hydroxy...	C46H50Cl2Cr...	88377-66-6
hydrogen bromide	hydrobromic acid	BrH	10035-10-6
hydrogen chloride	hydrochloric acid	ClH	7647-01-0
hydrogen cyanide	hydrocyanic acid	CHN	74-90-8
hydrogen fluoride	hydrofluoric acid	FH	7664-39-3
hydrogen iodide	hydroiodic acid	HI	10034-85-2
hydrogen phosphide	phosphine	H3P	7803-51-2
hydrogen selenide	hydrogen selenide (H2Se)	H2Se	7783-07-5
hydrogen selenide (H2Se)	hydrogen selenide (H2Se)	H2Se	7783-07-5

Mixture(s) with  to  components, consisting of ...

↑ ↓ 

< Back Forward > Search Cancel Help

For Help, press F1

# Results: Properties of Hydrogen in overview

Chemsafe-Lite 2010.1 - [Systems & Characteristics]

File Database Data Edit Options View Window Help

Pure components  
hydrogen (flammable;gas)

hydrogen (flammable;gas): Characteristics in overview

Property	N...	N...	characteristi...	Unit	>= °C	<= °C	>= ...	<= bar
★ autoignition temperature	1	1	560	°C				
★ critical density	1	1	0.03	g/cm <sup>3</sup>	-239.90	-239.90	12.96	12.96
★ critical pressure	1	1	12.96	bar	-239.90	-239.90	12.96	12.96
★ critical temperature	1	1	-239.9	°C	-239.90	-239.90	12.96	12.96
★ density (G)	1	1	8.99E-005	g/cm <sup>3</sup>	0.00	0.00	1.01	1.01
☰ Laws	33	33						
★ lower explosion limit	1	1	0.04	m <sup>2</sup> /m <sup>2</sup>	20.00	20.00	1.01	1.01
★ lower explosion limit (G)	2	9	0.056	m <sup>2</sup> /m <sup>2</sup>			20.00	150.00
★ maximum experimental safe gap	1	1	0.29	mm				
★ maximum experimental safe gap (G)	2	5	0.17 ... 1.63	mm	20.00	120.00	0.20	1.50
★ maximum explosion pressure	1	1	8.3	bar				
★ melting point	1	1	-259.19	°C				
★ minimum ignition energy	1	1	0.017	mJ				
★ molecular weight	1	1	2.016	g/mol				
★ normal boiling point	1	1	-252.8	°C				
★ relative density (G)	1	1	0.07	-				
★ stoichiometric fraction of combustible in mixture with ait	1	1	29.5	mol%				
★ stoichiometric fraction of combustible in mixture with oxygen	1	1	66.7	mol%				
★ Tci: limiting value for flammability	1	1	5.5	mol%				
★ upper explosion limit	1	1	0.77	m <sup>2</sup> /m <sup>2</sup>	20.00	20.00	1.01	1.01
★ upper explosion limit (G)	2	9	0.729 ... 0.738	m <sup>2</sup> /m <sup>2</sup>			20.00	150.00

Display Plot

For Help, press F1

# Results: Laws for Hydrogen in Overview


Chemsafe-Lite 2010.1 - [Systems & Characteristics]

File Database Data Edit Options View Window Help

Pure components

- hydrogen (flammable;gas)
  - autoignition temperatur
  - critical density
  - critical pressure
  - critical temperature
  - density (G)
  - Laws
  - lower explosion limit
  - lower explosion limit (C
  - maximum experimeta
  - maximum experimeta
  - maximum explosion pr
  - melting point
  - minimum ignition energ
  - molecular weight
  - normal boiling point
  - relative density (G)
  - stoichiometric fraction
  - stoichiometric fraction
  - Tci: limiting value for fla
  - upper explosion limit
  - upper explosion limit (C

hydrogen (flammable;gas): Laws



No.	Law	Category	Value	Meaning
1	UN-recommendations	class	2.1	flammable gases
2	IMDG-Co./GGVSee	class	2.1	Permanent Gases: Gases which cannot be liquified
3	ADR/GGVSE	class	2	Gases: compressed, liquefied or dissolved under p
4	ADR/GGVSE	1st subs. risk	2.1	Flammable gases
5	ADR/GGVSE	classification	1F	flammable compressed gases
6	RID/GGVSE	class	2	Gases: compressed, liquefied or dissolved under p
7	RID/GGVSE	1st subs. risk	2.1	Flammable gases
8	RID/GGVSE	classification	1F	flammable compressed gases
9	ADNR/GGVBinSch	class	2	Gases: compressed, liquefied or dissolved under p
10	ADNR/GGVBinSch	1st subs. risk	2.1	Flammable gases
11	ADNR/GGVBinSch	classification	1F	flammable compressed gases
12	ICAO/IATA-regulations	class	2.1	Permanent Gases: Gases which cannot be liquified
13	ICAO/IATA-regulations	pass. aircraft	FORBIDDEN	It is forbidden to transport this substance in a passe
14	ICAO/IATA-regulations	cargo aircraft	200	
15	ChemG	main risk	EXTREMELY FLAMMABLE	extremely flammable
16	ChemG	danger symbol	F+	extremely flammable
17	ChemG	R phrase	R12	Extremely flammable.
18	ChemG	S phrase	S(2)	Keep out of reach of children, when used out of indu

Display Plot

For Help, press F1

# Results: Table display for autoignition temperature of Hydrogen

Chemsafe-Lite 2010.1 - [Table: hydrogen - autoignition temperature]

File Database Data Edit Options View Window Help

Line no.	T ignition	max. explosion press.	min. ignition energy	MESG	combustible/air	combustible/O2	Table No	UTI	Source no.
	System	System	System	System	System	System			
	°C	bar	mJ	mm	mol%	mol%			
1	560	8.3	0.017	0.29	29.5	66.7	1	2010-OCT-20-14:06/25	1

+++ Table definition +++

Column No. 1 autoignition temperature, German standard, recommended  
 Column No. 2 maximum explosion pressure, recommended  
 Column No. 3 minimum ignition energy, recommended  
 Column No. 4 maximum experimental safe gap, recommended  
 Column No. 5 stoichiometric fraction of combustible in mixture with ait, recommended  
 Column No. 6 stoichiometric fraction of combustible in mixture with oxygen, recommended

+++ Substance and/or mixture identification +++

**hydrogen**

1. hydrogen

Formula: H<sub>2</sub>  
 EINECS: 215-605-7  
 Index-No.: 001-001-00-9  
 CAS-No.: 1333-74-0  
 Mol weight: 2.02 g/mol  
 Synonyms: Wasserstoffgas

- flammable  
 - gas

+++ Bibliographic data +++

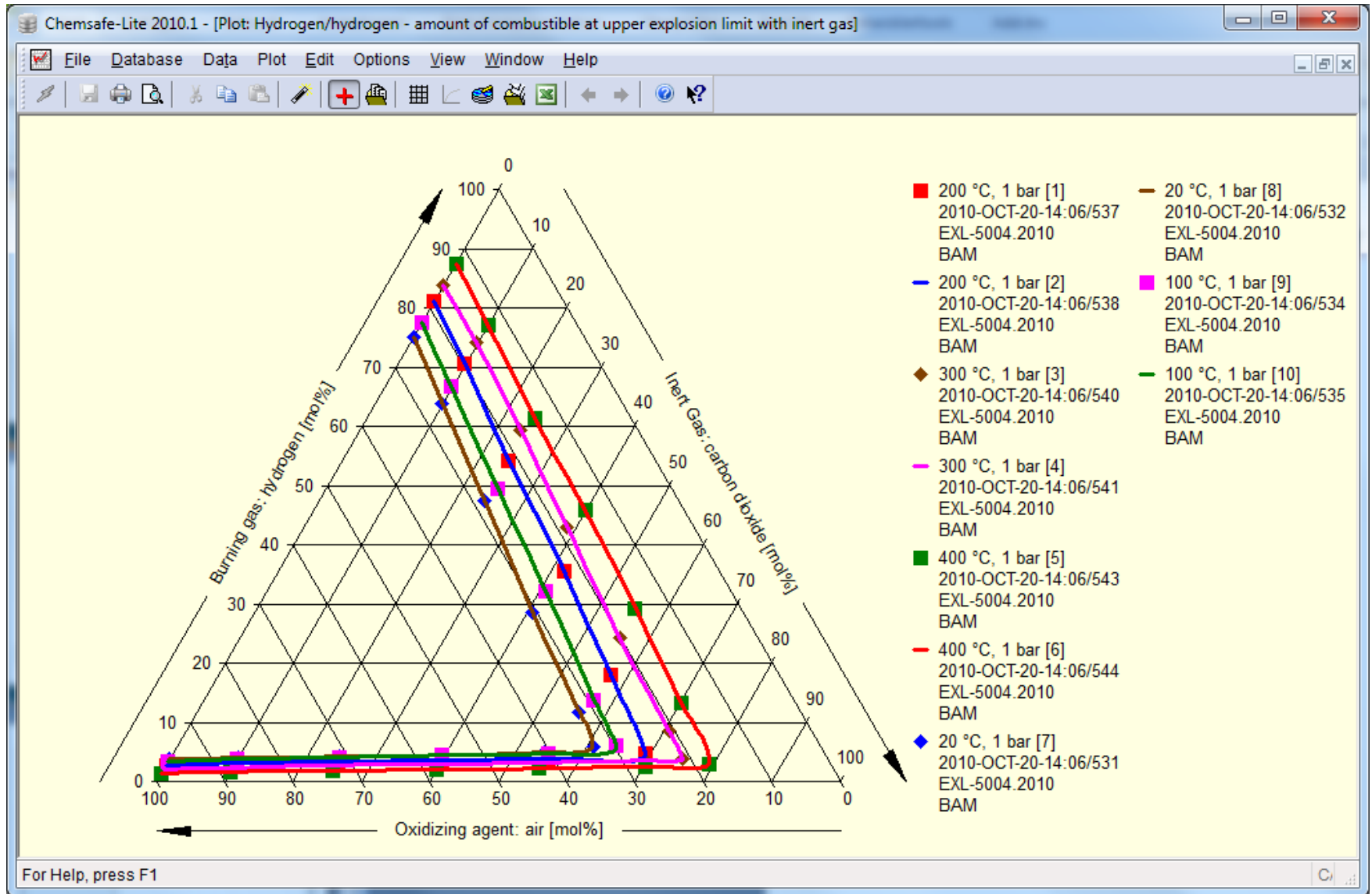
For Help, press F1

# Explosion ranges of mixtures with hydrogen in overview

The screenshot shows the Chemsafe-Lite 2010.1 software interface. The left sidebar displays a tree view of mixture categories, with 'Hydrogen/carbon dioxide/air mixture' selected. The main window displays a table titled 'Hydrogen/carbon dioxide/air mixture: amount of combustible at upper explosion limit with inert gas'. The table contains 10 rows of data, each representing a different mixture composition. The columns include 'No.', 'Property', 'C...', 'Year', 'A.', 'characteris...', 'Unit', 'temp...', 'pr...', and 'D...'. The 'Property' column for all rows is 'Explosion range of the system combustible/inert/air'. The 'C...' column shows values ranging from 10 to 25. The 'Year' column shows 2010 for all entries. The 'A.' column is empty. The 'characteris...' column shows explosion ranges (e.g., 4.93 ... 81.25). The 'Unit' column shows 'mol%'. The 'temp...' column shows temperatures (e.g., 200.00, 300.00, 400.00). The 'pr...' column shows values (e.g., 1.00). The 'D...' column shows 'BAM' for all entries.

No.	Property	C...	Year	A.	characteris...	Unit	temp...	pr...	D...
★ 1	Explosion range of the system combustible/inert/air	10	2010		4.93 ... 81.25	mol%	200.00	1.00	BAM
★ 2	Explosion range of the system combustible/inert/air	23	2010		4.34 ... 81.25	mol%	200.00	1.00	BAM
★ 3	Explosion range of the system combustible/inert/air	12	2010		3.95 ... 83.94	mol%	300.00	1.00	BAM
★ 4	Explosion range of the system combustible/inert/air	21	2010		3.76 ... 83.94	mol%	300.00	1.00	BAM
★ 5	Explosion range of the system combustible/inert/air	12	2010		3.06 ... 87.64	mol%	400.00	1.00	BAM
★ 6	Explosion range of the system combustible/inert/air	25	2010		2.95 ... 87.64	mol%	400.00	1.00	BAM
★ 7	Explosion range of the system combustible/inert/air	10	2010		5.91 ... 75.19	mol%	20.00	1.00	BAM
★ 8	Explosion range of the system combustible/inert/air	18	2010		5.72 ... 75.19	mol%	20.00	1.00	BAM
★ 9	Explosion range of the system combustible/inert/air	10	2010		6.22 ... 77.58	mol%	100.00	1.00	BAM
★ 10	Explosion range of the system combustible/inert/air	22	2010		5.6 ... 77.58	mol%	100.00	1.00	BAM

# Plot of explosion ranges for Hydrogen/CO<sub>2</sub>/Air-mixture





# Data for explosion range of Hydrogen/CO<sub>2</sub>/Air-mixture

Chemsafe-Lite 2010.1 - [Table: Hydrogen/hydrogen - amount of combustible at upper explosion limit with inert gas]

File Database Data Edit Options View Window Help

Line no.	T	p	inert gas	combustible LEL	combustible UEL	combustible LEL	combustible UEL	Table No	UTI	Source no.
	System	System	carbon dioxide	hydrogen	hydrogen	air	air			
	°C	bar	mol%	mol%	mol%	mol%	mol%			
1	200	1	0.00	2.86	81.25	97.14	18.75	1	2010-OCT-20-14:06/537	1
2			9.79	-	70.66	-	19.55			
3			9.90	3.19	-	86.91	-			
4			24.31	-	54.31	-	21.38			
5			24.81	3.50	-	71.69	-			
6			39.86	3.69	-	56.45	-			
7			41.77	-	35.71	-	22.52			
8			55.26	4.02	-	40.72	-			
9			57.34	-	18.09	-	24.57			
10			69.10	4.93	4.93	25.97	25.97			

+++ Table definition +++

Column No. 1 temperature  
 Column No. 2 pressure  
 Column No. 3 amount of inert gas in the mixture, carbon dioxide, recommended  
 Column No. 4 amount of combustible at lower explosion limit with inert gas, hydrogen, recommended  
 Column No. 5 amount of combustible at upper explosion limit with inert gas, hydrogen, recommended  
 Column No. 6 amount of oxidator at lower explosion limit with inert gas, air, recommended  
 Column No. 7 amount of oxidator at upper explosion limit with inert gas, air, recommended

+++ Substance and/or mixture identification +++

Hydrogen/hydrogen

For Help, press F1

# Example for dust layers: Data of Zinc

The screenshot shows the Chemsafe-Lite 2010.1 interface. The left pane displays a tree view of 'Pure components' with the following entries:

- zinc (BIA-No 0731;from raw zinc coating;flammable;dust)
- zinc (BIA-No 0732;from raw zinc coating;flammable;dust)
- zinc (BIA-No 0734;from cutting;flammable;dust)
- zinc (BIA-No 0735;produced by fining and flapping (blowing);flammable;dust)
- zinc (BIA-No 2502;sprayed by electric arc;flammable;dust)
- zinc (BIA-No 2503;flammable;dust)
- zinc (BIA-No 2504;sprayed by flame;flammable;dust)
- zinc (BIA-No 2505;sprayed by electric arc;flammable;dust)
- zinc (BIA-No 2506;sprayed by flame;flammable;dust)
- zinc (BIA-No 2507;sprayed by flame;flammable;dust)
- zinc (BIA-No 2508;flammable;dust)
- zinc (flammable;dust;moist;from filtration plant of zinc melt factory)

The right pane shows the 'Characteristics in overview' for the selected component. The data is as follows:

Property	N...	N...	c...	Unit	>...	<...	>...
★ burning index (S)	1	1	2	-			
★ KST-value (S)	1	1	85	bar.m/s			
★ maximum explosion pressure (S)	1	1	7	bar			
★ median value (S)	1	1	19	µm			
★ minimum ignition temperature of a dust cloud (S)	1	1	800	°C			

Buttons for 'Display' and 'Plot' are visible at the bottom of the right pane.

# Example for dust layers: KST-value of Zinc-layer

Chemsafe-Lite 2010.1 - [Table: zinc - KST-value (S)]

File Database Data Edit Options View Window Help

Line no.	max. explosion press.	KST-value	Table No	UTI	Source no.	Constraint(s)
	S	S				
	System	System				
	bar	bar.m/s				
1	7	85	1	2010-OCT-20-14:30/4499	1	A,B

+++ Side condition(s) +++

A)

particle size	fraction
m	kg/kg
0.0E+000 ... 2.0E-005	0.530000
2.0E-005 ... 3.2E-005	0.190000
3.2E-005 ... 7.1E-005	0.190000
	0.090000

Column No. 1 particle size (S), as received, recommended  
 Column No. 2 fraction (S), as received, recommended

B) median value

median value: 19 µm median value (S), as received, recommended

+++ Bibliographic data +++

(1) ID: EXL-7521.1987  
 Language: col  
 Institution: Berufsgenossenschaftliches Institut fuer Arbeitssicherheit, (BIA) Institut fuer Explosionsschutz und Sprengtechnik  
 Titel: Brenn- und Explosions-Kenngroessen von Staeeuben  
 Journal: Erich Schmidt Verlag;Bielefeld(Pub.)  
 published: 1987  
 Abstract: Explosion limits, explosion pressures, Kst-values, dust explosion classes, ignition temperatures of dust clouds and dust layers, and burning index.  
 Measurements: VDI 2263, VDE 0165, and others.

For Help, press F1