



SpringerMaterials

助力您材料科学与工程的研究

巨蓉, 施普林格·自然数据库产品经理

SPRINGER NATURE

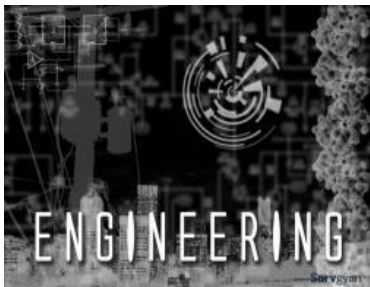
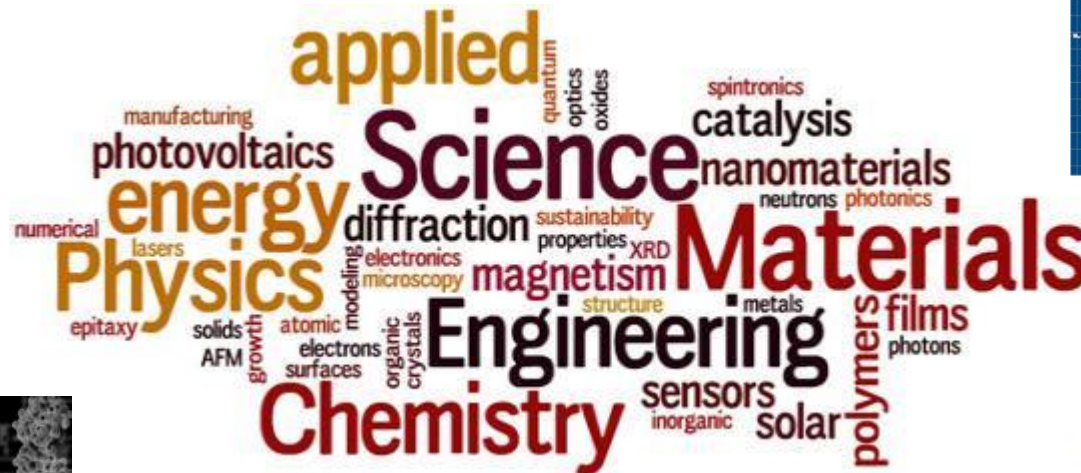
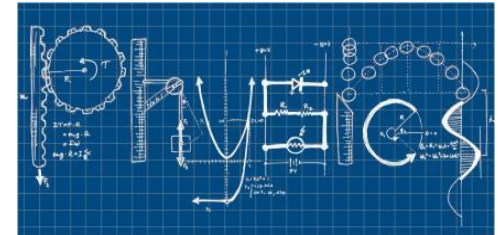
提纲:

1. 背景介绍
2. SpringerMaterials简介
3. 使用方法
4. 问题解答

背景介绍

-

<div>6</div> <div>²₄</div> <div>C</div> <div>Carbon</div> <div>12.0107</div>	<div>2</div> <div>²₂</div> <div>He</div> <div>Helium</div> <div>4.002602</div>	<div>25</div> <div>²₈¹³₂</div> <div>Mn</div> <div>Manganese</div> <div>54.938045</div>	<div>53</div> <div>²₈¹⁸₁₈⁷</div> <div>I</div> <div>Iodine</div> <div>126.90447</div>	<div>16</div> <div>²₈⁶</div> <div>S</div> <div>Sulfur</div> <div>32.065</div>	<div>69</div> <div>²₈¹⁸₃₁⁸₂</div> <div>Tm</div> <div>Thulium</div> <div>168.93421</div>	<div>86</div> <div>²₈¹⁸₃₂¹⁸₈</div> <div>Rn</div> <div>Radon</div> <div>[222]</div>	<div>39</div> <div>²₈¹⁸₂</div> <div>Y</div> <div>Yttrium</div> <div>88.90585</div>
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- 1) strangematterexhibit.com/whatis.html
- 2) en.wikipedia.org/wiki/Materials_science
- 3) rit.edu/cos/cmse/

材料种类



金属



陶瓷



高聚物



玻璃



电子材料



复合材料



矿物



生物材料



外来材料

材料科学涉及的领域

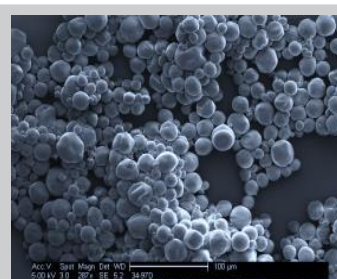
半导体和电子学



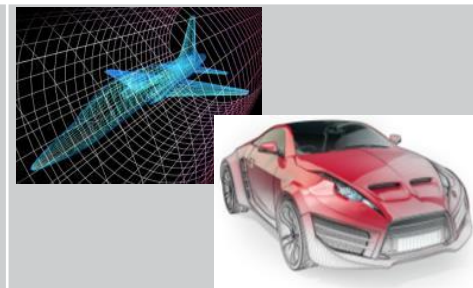
化工与制造



化学加工与分析



汽车航空工程



燃料与能源



玻璃与陶瓷



金属与冶金



高分子科学



SpringerMaterials简介

SpringerMaterials是什么?

SpringerMaterials: 经筛选整理的**材料性质**数据库

主要材料类型与性质分类包括

金属
与合金

陶瓷
与玻璃

高分子聚
合物

有机物

复合材料

原子
与原子核



物理



化学



热力学



电磁学



结构



机械



光谱学

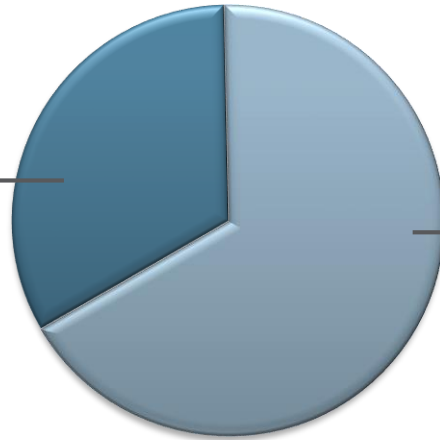


原子能

SpringerMaterials由多个专业子数据库组成



Landolt Börnstein



- Linus Pauling Files – Inorganic Solid Phases
- Thermophysical Properties (aka Dortmund Data Bank)
- Adsorption Database
- Polymer Thermodynamics Database (ATHAS)
- NIST Corrosion Database
- MSI Eureka
- Dortmund Databank of Separation Technology
- SpringerMaterials Interactive
- SpringerMaterials Fundamentals Handbooks
- Substance Profiles
- NMR data collection
- Springer Handbooks (e.g., VDI Heat Atlas)



数据库内容按季度持续更新

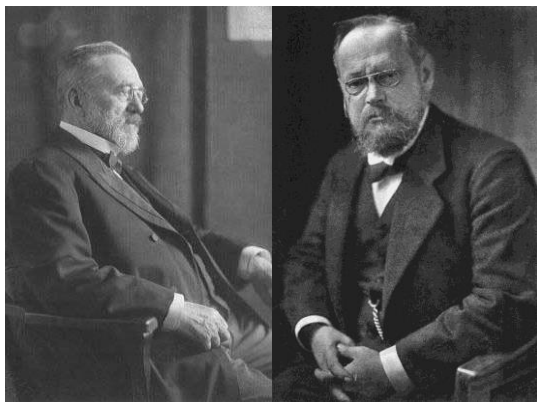
SPRINGERNATURE

**LANDOLT-
BÖRNSTEIN**

实验结果综述，最佳实验做法，
等等

由超过1000名专家、学
者、编辑评审的数据

柏林
1883



Hans Landolt

Richard
Börnstein



The Landolt-Börnstein Series

Landolt-Börnstein: 威名显赫的用户

ANNALEN DER PHYSIK.

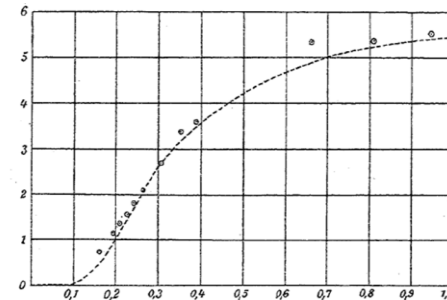
9. Die Plancksche Theorie der Strahlung und die Theorie der spezifischen Wärme; von **A. Einstein.**

In zwei früheren Arbeiten¹⁾ habe ich gezeigt, daß die Interpretation des Energieverteilungsgesetzes der schwarzen Strahlung im Sinne der Boltzmannschen Theorie des zweiten Hauptsatzes uns zu einer neuen Auffassung der Phänomene der Lichtemission und Lichtabsorption führt, die zwar noch keineswegs den Charakter einer vollständigen Theorie besitzt, die aber insofern bemerkenswert ist, als sie das Verständnis einer Reihe von Gesetzmäßigkeiten erleichtert. In der vorliegenden Arbeit soll nun dargetan werden, daß die Theorie der Strahlung — und zwar speziell die Plancksche Theorie — zu einer Modifikation der molekular-kinetischen Theorie der Wärme führt, durch welche einige Schwierigkeiten beseitigt werden, die bisher der Durchführung jener Theorie im Wege standen. Auch wird sich ein gewisser Zusammenhang zwischen dem thermischen und optischen Verhalten fester Körper ergeben.

Bern, November 1906.

(Eingegangen 9. November 1906.)

190 A. Einstein. Plancksche Theorie der Strahlung etc.



betreffenden festen Stoffe vorkommen, für die spezifische Wärme pro Grammäquivalent den Ausdruck¹⁾

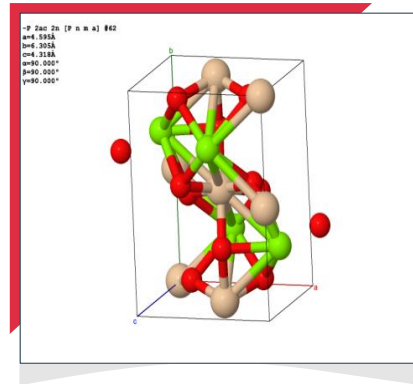
$$(8a) \quad c = 5,94 \sum \frac{e^{\frac{\beta\nu}{T} \left(\frac{\beta\nu}{T} \right)^2}}{\left(e^{\frac{\beta\nu}{T}} - 1 \right)^2}.$$

Wir entnehmen ferner den **Tabellen von Landolt und Börnstein** einige Angaben über ultrarote Eigenschwingungen (metallische Reflexion, Reststrahlen) einiger durchsichtiger fester Körper; die beobachteten λ sind in nachstehender Tabelle unter „ $\lambda_{\text{beob.}}$ “ angegeben; die Zahlen unter „ $\lambda_{\text{ber.}}$ “ sind obiger Tabelle entnommen, soweit sie sich auf Atome von abnorm kleiner spezifischer Wärme beziehen; für die übrigen soll $\lambda > 48 \mu$ sein.

Körper	$\lambda_{\text{beob.}}$	$\lambda_{\text{ber.}}$
CaFl	24; 31,6	33; > 48
NaCl	51,2	> 48
KCl	61,2	> 48
CaCO ₃	6,7; 11,4; 29,4	12; 21; > 48
SiO ₂	8,5; 9,0; 20,7	20; 21

关键材料科学主题涵盖





Adsorption of Toluene on Amberstorb 600 (Resin)

Orihan Talu: Adsorption Database in SpringerMaterials. Springer, 2014

Adsorption N [mol/kg]

Pressure p [kPa]

$T = 273.15 \text{ K}$
 C_7H_8 on Amberstorb 600
 Choung, J. Chem. Eng. Data (2001)

[illegible]

Ref. p. 501

2 Scanning tunneling microscopy of metals and semiconductors

17

2.2.3 Ag, Silver

Ag(100)

Atomically resolved STM images show the expected square lattice arrangement of individual atoms on this surface [98C]. Changes in surface morphology due to ion sputtering process have been investigated using STM topographic images acquired over different sputtering conditions and substrate temperatures [98C]. The study shows that periodic patterns of square islands are formed on this surface when sputtering at substrate temperatures between 250 and 450 K.

Ag(110)

STM images of Ag(110) acquired at 500 K show the expected structure of atomic rows running along the [110] surface direction [98C]. On this surface, the role of tip-surface interaction has been studied using an elevated temperature STM [98B, 98E]. At 560 K, the step edges of Ag(110) show several long fingers along the scanning direction (Fig. 2.11 [98E]) and this effect is explained as different tip forces induced by the STM tip. At 500 K, the step edges are perpendicular to the fixed-polarization direction along the step edge direction [98C, 98E], thus stable step edges can be observed in STM images. Other studies of Ag(110) include the study of surface Ag [98C] and changes in surface morphology due to ion sputtering process [98C, 98C].

Ag(111)

Fig. 2.11 (a) and (b) 25–25 nm STM images of the same area of Ag(110) at 560±10 K and different bias scanning directions. (a) Parallel to scanning direction. (b) Perpendicular to scanning direction. The STM tips show that parallel to the scanning direction, the step edges are perpendicular to the fixed-polarization direction along the step edge direction [98C, 98E], thus stable step edges can be observed in STM images. Other studies of Ag(110) include the study of surface Ag [98C] and changes in surface morphology due to ion sputtering process [98C, 98C].

Fig. 2.11 (a) and (b) 25–25 nm STM images of the same area of Ag(110) at 560±10 K and different bias scanning directions. (a) Parallel to scanning direction. (b) Perpendicular to scanning direction. The STM tips show that parallel to the scanning direction, the step edges are perpendicular to the fixed-polarization direction along the step edge direction [98C, 98E], thus stable step edges can be observed in STM images. Other studies of Ag(110) include the study of surface Ag [98C] and changes in surface morphology due to ion sputtering process [98C, 98C].

核心功能及使用方法



[H Search by Elements](#)[Search by Structure](#)[Corrosion Search](#)[✉ Contact us](#)

Browse by collection

[Landolt-Börnstein](#)[Adsorption](#)[Inorganic Solid Phases](#)[MSI Eureka](#)[Polymer Thermodynamics](#)[Substance Profile](#)[Thermophysical Properties](#)[Landolt-Börnstein bookshelf](#)

Fast and easy access to curated data on the properties of materials

from the Landolt-Börnstein New Series, the Linus Pauling Files and other integrated resources - [find out how it can work for you.](#)

LATEST DEVELOPMENTS ON SPRINGER MATERIALS



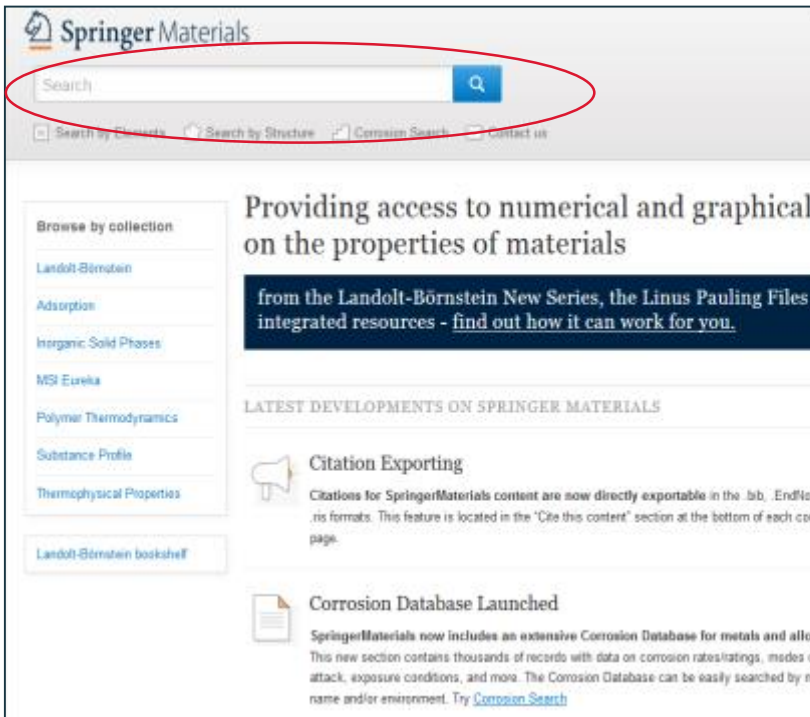
Content Updates in December 2016

Updates to the Landolt-Börnstein, SpringerMaterials Fundamentals now available. [View more...](#)

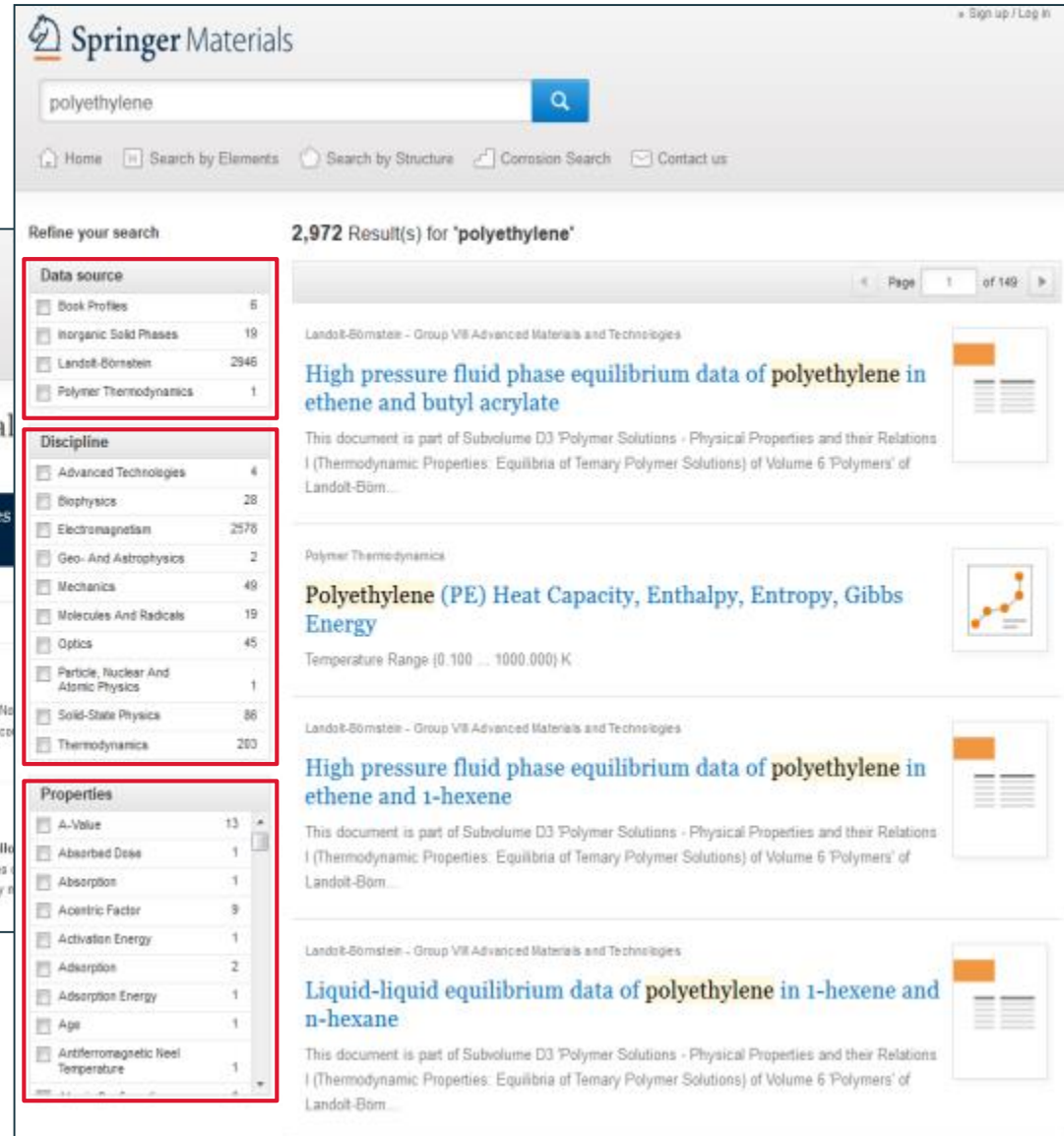
materials.springer.com

文本框检索和结果细化

- 可以根据数据源、规程和/或单个材料属性对结果进行细化:



The image shows the Springer Materials homepage. The search bar is highlighted with a red circle. Below the search bar, there are links for 'Search by Elements', 'Search by Structure', 'Corrosion Search', and 'Contact us'. On the left, there is a 'Browse by collection' sidebar with links to 'Landolt-Börnstein', 'Adsorption', 'Inorganic Solid Phases', 'MSI Eureka', 'Polymer Thermodynamics', 'Substance Profile', and 'Thermophysical Properties'. The main content area features a banner about 'Providing access to numerical and graphical on the properties of materials' and a section for 'LATEST DEVELOPMENTS ON SPRINGER MATERIALS' with articles on 'Citation Exporting' and 'Corrosion Database Launched'.



The image shows the Springer Materials search results for 'polyethylene'. The search bar contains 'polyethylene' and the search button is highlighted. The results show 2,972 results. The filters on the left are highlighted with red boxes:

- Data source**
 - Book Profiles: 5
 - Inorganic Solid Phases: 19
 - Landolt-Börnstein: 2946
 - Polymer Thermodynamics: 1
- Discipline**
 - Advanced Technologies: 4
 - Biophysics: 28
 - Electromagnetism: 2576
 - Geo- And Astrophysics: 2
 - Mechanics: 49
 - Molecules And Radicals: 19
 - Optics: 45
 - Particle, Nuclear And Atomic Physics: 1
 - Solid-State Physics: 86
 - Thermodynamics: 263
- Properties**
 - A-Value: 13
 - Absorbed Dose: 1
 - Absorption: 1
 - Acentric Factor: 9
 - Activation Energy: 1
 - Adsorption: 2
 - Adsorption Energy: 1
 - Age: 1
 - Antiferromagnetic Neel Temperature: 1

The search results list several documents, including:

- High pressure fluid phase equilibrium data of polyethylene in ethene and butyl acrylate**
- Polyethylene (PE) Heat Capacity, Enthalpy, Entropy, Gibbs Energy**
- High pressure fluid phase equilibrium data of polyethylene in ethene and 1-hexene**
- Liquid-liquid equilibrium data of polyethylene in 1-hexene and n-hexane**

• Query: Nb-W

Search by Elements

Search for information by element system

Select elements from the periodic table to search by element system.

= No results in SpringerMaterials when combined with your selection

Reset

Search by Elements

Search for information by element system

Your Selection
Nb-W

173 Matching element systems

Nb-W (33)

Al-Nb-W (3)

B-Nb-W (2)

C-Nb-W (26)

Co-Nb-W (2)

Cr-Nb-W (2)

Cu-Nb-W (4)

Fe-Nb-W (5)

H-Nb-W (1)

Mo-Nb-W (2)

N-Nb-W (4)

Nb-Ni-W (11)

= No results in SpringerMaterials when combined with your selection

Reset

Refine your search

Data source

- ☐ Inorganic Solid Phases 16
- ☐ Landolt-Börnstein 17

Discipline

- ☐ Advanced Technologies 6
- ☐ Biophysics 7
- ☐ Electromagnetism 9
- ☐ Mechanics 2
- ☐ Optics 6
- ☐ Solid-State Physics 19
- ☐ Thermodynamics 18

Properties

- ☐ Atomic Environment 5
- ☐ Atomic Position 5
- ☐ Cell Volume 5
- ☐ Chemical Diffusion 2
- ☐ Crystal Structure 7
- ☐ Crystallographic Data 6
- ☐ Debye Frequency 1
- ☐ Density 1
- ☐ Dielectricity 3
- ☐ Diffusion 10

33 Result(s) for 'Nb-W'

Page 1 of 2

Landolt-Börnstein - Group III Condensed Matter

Additional data to section 1.4.1 Resistivity/atomic percent impurity in dilute alloys

This document is part of Subvolume B 'Electrical Resistivity, Thermoelectrical Power and Optical Properties' of Volume 15 'Metals: Electronic Transport Phenomena' of Landolt-Börnstein - Group III Condensed M...

Inorganic Solid Phases

Nb-W Binary Phase Diagram 0-100 at.% W

Temperature: 2200...3600 °C (2473...3873 K); Full composition
Investigation: experimental; detailed

Inorganic Solid Phases

Nb₅₀W₅₀ (Nb_{0.5}W_{0.5}) Crystal Structure

Element system Nb-W, Phase prototype W, Space group *cI*2, 229
Data on Cell parameters, Published and standardized atom coordinates

Inorganic Solid Phases

Nb_{0.5}W_{0.5} Young modulus

Element system: Nb-W; Phase prototype: W; Pearson symbol: *cI*2; Space group: 229.
Data points: 3; Samples: 1; Journal references: 1.

Inorganic Solid Phases

Nb-W Binary Phase Diagram 0-100 at.% W

Temperature: 2200...3400 °C (2473...3673 K); Full composition
Investigation: experimental; detailed

Inorganic Solid Phases










Nb-W Binary Phase Diagram 0-100 at.% W


Temperature: 2300...3500 °C (2573...3773 K); Full composition
Investigation: experimental; detailed

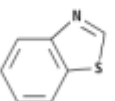
- Query: 苯并噻唑 / 苯硫氮醇 (benzothiazole)

Search by Structure

Start by drawing a structure

Reset         

C N O S  F



Page 1 of 2

Benzothiazole

Molecular Formula: C_7H_5NS InChI: InChI=1S/C7H5NS/c1-2-4-7-6(3-1)8-5-9-7h1-5H
Molecular Mass: - InChI Key: IOJULGTWVMSFF-UHFFFAOYSA-N
CAS-No: 128366-28-9, 95-16-9

[View substance profile](#) [Search for this substance](#)

100 % match

6-Methyl-Benzothiazole

Molecular Formula: C_8H_7NS InChI: InChI=1S/C8H7NS/c1-6-9-7-4(4-6)10-5-9-7h2-5H, 1H3
Molecular Mass: - InChI Key: IVKILQAPNDICURU-UHFFFAOYSA-N
CAS-No: 2942-15-6

[View substance profile](#) [Search for this substance](#)

90 % match

2-Methyl-Benzothiazole

Molecular Formula: C_8H_7NS InChI: InChI=1S/C8H7NS/c1-6-9-7-4-3-5-8(7)10-6h2-5H, 1H3
Molecular Mass: - InChI Key: OXYYSQDQWQCSKKO-UHFFFAOYSA-N
CAS-No: 120-75-2

[View substance profile](#) [Search for this substance](#)

90 % match

Benzothiazol-2-Ylamine

Molecular Formula: $C_7H_5N_2S$ InChI: InChI=1S/C7H5N2S/c8-7-9-5-3-1-2-4-6(5)10-7h1-4H, (H2,8,9)
Molecular Mass: - InChI Key: UHGULLUBCTEF-UHFFFAOYSA-N
CAS-No: 120045-46-7, 136-95-8, 35858-53-8

[View substance profile](#) [Search for this substance](#)

90 % match

2-(Methylamino)Benzothiazole

Molecular Formula: $C_8H_9N_2S$ InChI: InChI=1S/C8H9N2S/c1-9-8-10-6-4-2-3-5-7(8)11-8
Molecular Mass: - InChI Key: QVKPPRYUGJFISN-UHFFFAOYSA-N
CAS-No: 16954-69-1

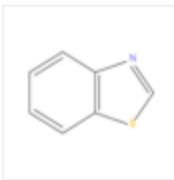
[View substance profile](#) [Search for this substance](#)

82 % match

Substance Profile

Benzothiazole

Molecular Formula: C_7H_5NS
Element System: C-H-N-S
CAS-RN: 128366-28-9, 95-16-9
InChI: InChI=1S/C7H5NS/c1-2-4-7-6(3-1)8-5-9-7h1-5H



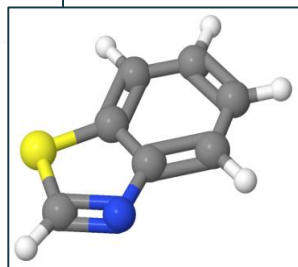
[View 3D Interactive Structure](#)

Explore this substance

[View all 8 documents](#)

Properties frequently appearing with benzothiazole

» Phase Equilibrium (2)	» Phase Transition Temperature (1)	» Diamagnetic Susceptibility (1)
» Osmotic Pressure (2)	» Phase Transition (1)	» Nuclear Quadrupole Resonance Spectroscopy (1)
» Vapor-Liquid Equilibrium (2)	» Heat Of Fusion (1)	» Vapor Pressure (1)
» Evaporation Data (1)	» Boiling Point (1)	» Heat Of Sublimation (1)
» Melting Temperature (1)	» Diamagnetic Susceptibility Evaluation (1)	» Refractive Index (1)
» Magnetic Susceptibility Evaluation (1)	» Magnetic Susceptibility (1)	» Heat Of Transition (1)
» Transition Enthalpy (1)	» Quadrupole Coupling (1)	» Asymmetry Parameter (1)
» Differential Scanning Calorimetry (1)	» Density (1)	
» See Less		



- 按物料及环境搜寻及分类

Corrosion Search

Seawater-301 stainless steel / 2Ni steel

Find out a corrosion rate and its relevant details by entering a material and/or environment into the search box below.

environment: Seawater × material: 301 stainless steel × material: 2Ni steel ×

Enter material and/or environment

7 results

Material	Environment	Rating
301 stainless steel	Seawater	A (Resistant) ≤ 0.125 mm/year
2Ni steel	Seawater	A (Resistant) 0.084 mm/year
2Ni steel	Seawater	A (Resistant) 0.1 mm/year
2Ni steel	Seawater	B (Good) 0.19 mm/year
301 stainless steel	Seawater	C (Questionable) 0.5 - 1.25 mm/year
2Ni steel	Seawater	Localized
2Ni steel	Seawater	Localized

[Download this table \(CSV format, UTF-8 encoded\)](#)

Corrosion Search

Find out a corrosion rate and its relevant details by entering a material and/or environment into the search box below.

material: Niobium ×

Enter material and/or environment

157 results

铌在硫酸 (Niobium in sulfuric acid)

2 of 16

Material	Environment	Rating	Show all details
Niobium	Sulfuric Acid 98 %	A (Resistant) 5.0E-4 mm/year	
Condition:	Temperature: 19.0 °C - 26.0 °C	Duration: 36 d	
		Localised attack:	
UNS No: R04210	Reference: Metals Handbook, Ninth Edition, Vol 13, Corrosion, ASM International, Metals Park, OH, 1987, p 730		^ Less details
Niobium	Sulfuric Acid 72 %	A (Resistant) 0.1 mm/year	v More details
Niobium	Sulfuric Acid 72 %	A (Resistant) 0.03 mm/year	v More details
Niobium	Sulfuric Acid 50 %	A (Resistant) ≤ 0.125 mm/year	v More details
Niobium	Sulfuric Acid 50 %	A (Resistant) ≤ 0.125 mm/year	v More details

晶体结构及互动功能

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Query: ZrO₂ monoclinic Crystal structure

Inorganic Solid Phases

ZrO₂ monoclinic (ZrO₂ rt) Crystal Structure

[Download Data](#)

General Information

Phase Label(s): ZrO₂ rt
Structure Class(es): –
Classification by Properties: ionic conductor, nonmetal
Mineral Name(s): baddeleyite
Pearson Symbol: mP12
Space Group: 14
Phase Prototype: ZrO₂-b
Measurement Detail(s): –
Phase Class(es): –
Compound Class(es): oxide
Interpretation Detail(s): complete str
Sample Detail(s): –

[View 3D Interactive Structure](#)

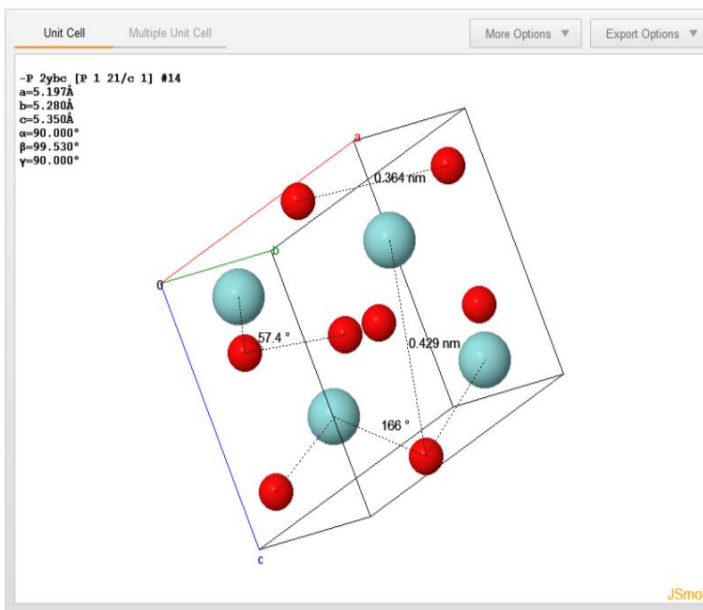
Substance Summary

Standard Formula: ZrO₂
Alphabetic Formula: O₂Zr
Published Formula: ZrO₂ monoclinic
Refined Formula: O₂Zr
Wyckoff Sequence: 14, e³
Z Formula Units: 4
Density: $\rho = 5.65 \text{ Mg m}^{-3}$

Experimental Details

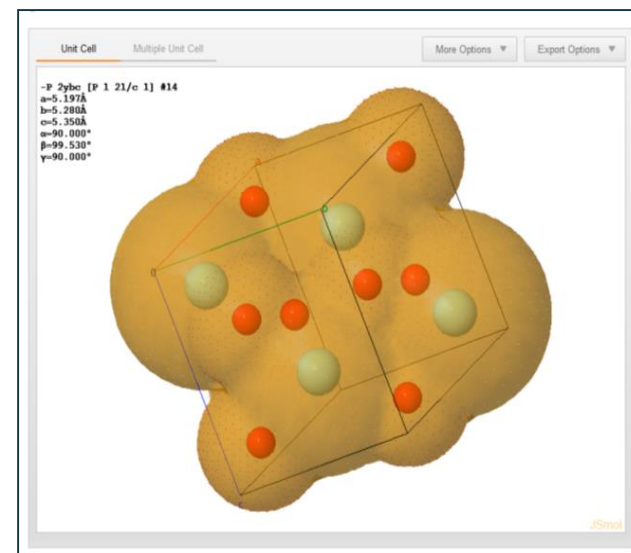
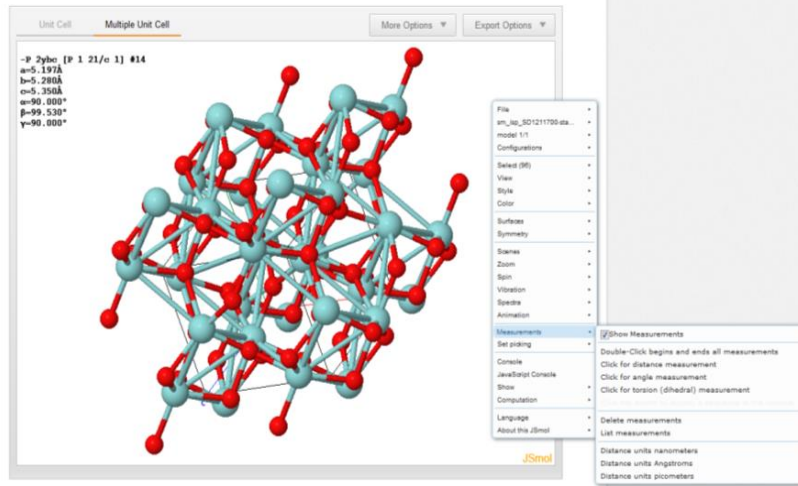
Reference

3D Interactive Structure



Reference

3D Interactive Structure



相图、数据及互动功能

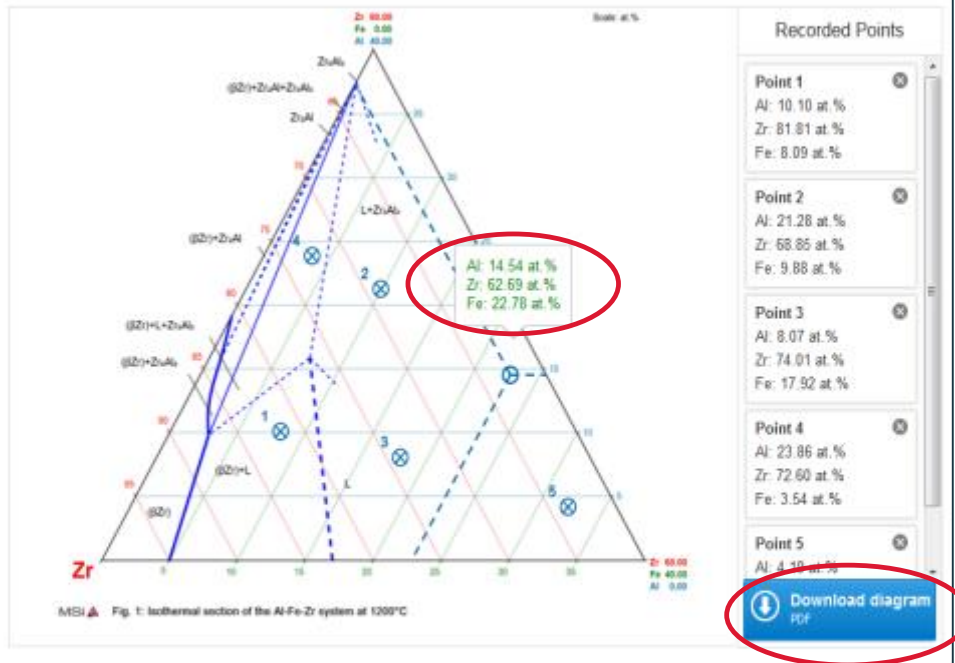
22

- Interactive Phase Diagrams: (Al-Fe-Zr):

Isothermal section of the Al-Fe-Zr system at 1200°C

Figure 1 from evaluation report:

Al-Fe-Zr Ternary Phase Diagram Evaluation



General Information

Concentration Range: Fe conc. [0-40 at. %] vs. Al conc. [0-40 at. %] vs. Zr conc. [60-100 at. %]
Temperature: 1200 °C

Reference

- Data Table Sliders:

Polymer Thermodynamics

Polyoxyoctamethylene (PO8M) Heat Capacity, Enthalpy, Entropy, Gibbs Energy

Substance Details

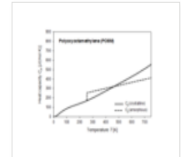
Polyoxyoctamethylene

Polymer code: PO8M

Substance class: Aliphatic Poly(oxide)s

CAS Number: -

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View Chart

Calculated and Experimental data

Calculated Data

Amorphous + Crystalline

Experimental Data

Crystalline

Filter data by:

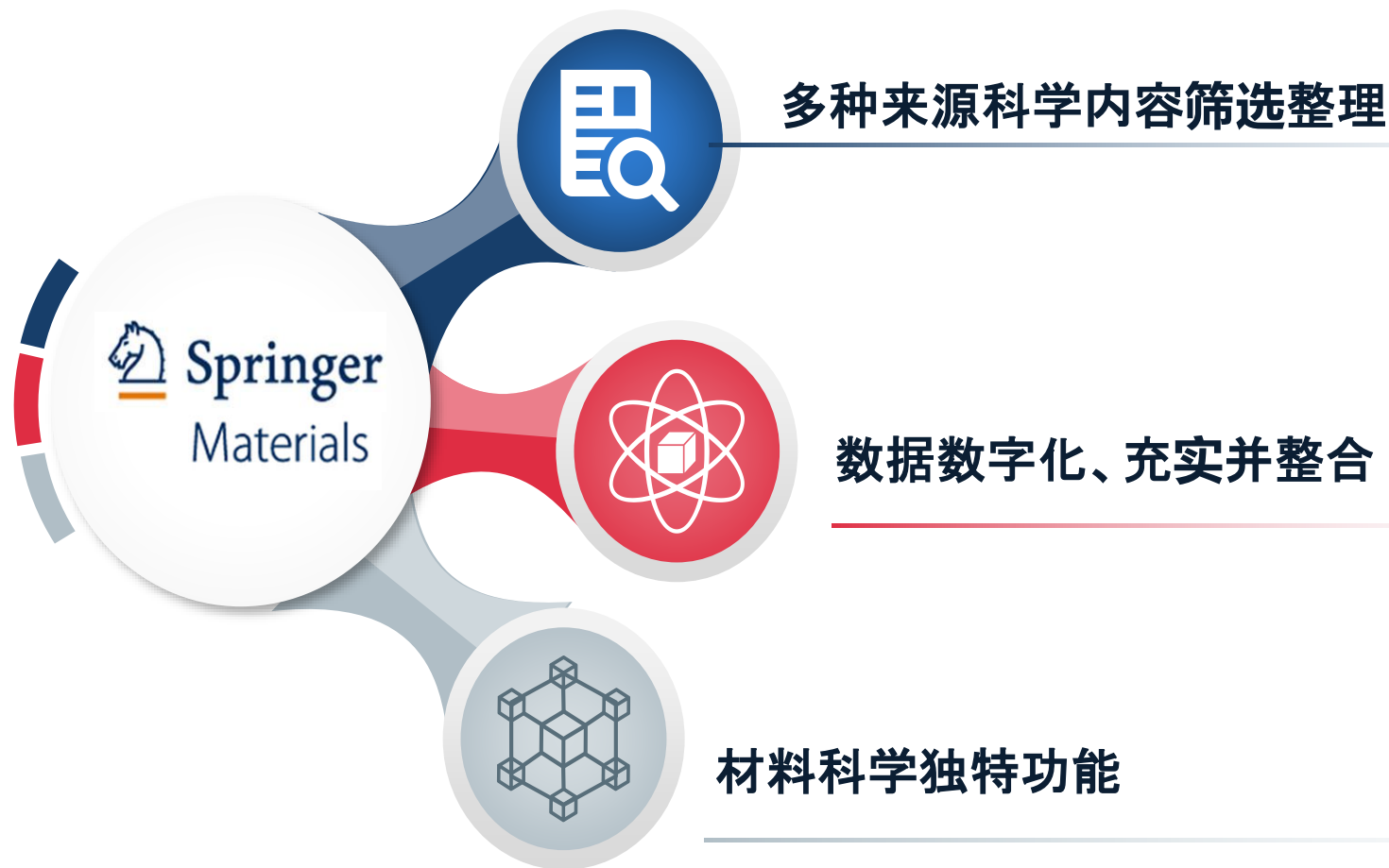
Temperature [K]:

154.1 — 698.1

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Temperature T [K]	Amorphous State					Crystalline State		
	Heat Capacity C_p [J/(K·mol)]	Enthalpy $H-H_0[c]$ [J/mol]	Entropy S [J/(K·mol)]	Gibbs Energy $H_0[c]-G$ [J/mol]	Note	Heat Capacity C_p [J/(K·mol)]	Enthalpy $H-H_0[c]$ [J/mol]	Entropy S [J/(K·mol)]
160.000	119.9360	33381.0900	178.3540	-4844.4500	7	119.9360	10291.4300	114.97
170.000	124.8230	34604.5700	185.7630	-3024.8600	7	124.8230	11514.9000	122.38
180.000	129.7390	35877.4600	193.0470	-1129.0000	7	129.7390	12787.7900	129.66
190.000	134.6990	37199.1400	200.1740	833.9200	7	134.6990	14109.4700	136.79
200.000	139.7570	38571.9800	207.2300	2874.0200	7	139.7570	15482.3100	143.84
210.000	144.9390	39995.0500	214.1650	4979.6000	7	144.9390	16905.3800	150.78
220.000	150.2640	41471.0300	221.0400	7157.7700	7	150.2640	18381.3600	157.65

SpringerMaterials: 打造现代数据库



数据来源:经典 Landolt-Börnstein系列、MSI Eureka、Linus Pauling文档-无机固相、聚合物热力学数据库(ATHAS)、Dortmund分离技术数据库、施普林格系列手册(例如, VDI Heat Atlas)、吸附数据库、NIST腐蚀数据库、SpringerMaterials基础知识手册

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Rong Ju, Ph.D.

rong.ju@springernature.com

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+49 62213454303