

3.1 SODIUM METAL

The chemical element

Sodium is widely spread on the surface of the earth, especially in form of salt. It is ranking on position seven of the most abundant elements and represents 2,83% of the mass of earth crust.



Davy in the year 1807 was the first to prepare sodium in metallic form, using a Volta column for electrolysis of molten sodium hydroxide.

The first method for manufacture of sodium in technical scale was the Deville-process starting 1845.

In this process a mixture of coke, lime was heated up to 1,000 °C in iron trays and the sodium was condensed.

Castner in 1891 developed the electrolytical path for preparation of sodium starting with molten sodium hydroxide on a commercial scale.

This technology was leading method for almost four decades. Beginning 1921 the molten salt electrolysis according to Downs started to be the mostly used industrial procedure. Today this is the only method for manufacture of sodium. A ternary mixture of Na/Cl/CaCl₂/Ba/Cl₂, is used, melting at approx. 600 °C. For special applications (nuclear power plants) the primary high quality sodium is treated with Na₂O or Na₂O₂ at 300 – 400 °C to further reduce the calcium content to below 10 ppm.

Physical and chemical properties:

Order number	11
Atomic weight	22,990 u
Melting point	97,82 °C
Boiling point	881,4 °C

crit. temperatur / pressure ca.2460 / 413 bar
 Volume expansion at melting point 2,70 %
 heat of fusion 113 J/g

Physical data for sodium in different states of aggregation

Unit	solid		liquid				
	20 °C	97,82 °C	97,82 °C	100 °C	400 °C	550 °C	881,4 °C
temperture: °C							
Density (g/cm ³)	0,968	0,951	0,927	0,927	0,857	0,821	0,74
Dyn. viscosity (mPa.s)	na	na	na	0,68	0,284	0,225	0,149
Surface tension (mN/cm)	na	na.	1,92	na	1,61	1,46	1,13
Spec. resistance (µOhm.cm)	4,88	6,6	9,64	9,67	22,14	29,91	52,87
Heat capacity (W/mK)	132,3	87	87	na	72,2	64,8	48,6
spec. Hheat (J/gK)	1,22	1,34	1,38	1,28	1,26	1,285	2,721

na= not available

Dr. Bilger Umweltconsulting GmbH offers SODIUM in following high quality specification:

Gehalt	Einheit	min.	max.
Sodium[Na]	%	99,9	
Potassium[K]	ppm		300
Calcium[Ca]	ppm		400

Our high quality Sodium is supplied in for of ingots or single packed in gas tight aluminium compound foil (→ [BINAL®](#)).

Storage



Proper sealed Sodium can be stored in dry environment without time limitation. Sprinkler units are forbidden in storage area.

The floor of the storage area shall be higher than surrounding place to avoid any possible access of rain water. Roof with glass is prohibited. Condensing water must be avoided by technical means. The storage facilities must be marked clearly and locked.

On the safety labels it has to be included clear **warning for non usefull extinguishing agents.**

- Keep container dry and closed thoroughly
- For extinguishing only use anhydrous soda, rock salt or dry concrete
- Do never use water and conventional extinguishers on basis of powder or wet agents such as foam.

Appropriate extinguishing equipment must be on site.