

3. CHEMICAL AND PHYSICAL INFORMATION

3.1 CHEMICAL IDENTITY

The chemical identities of various vanadium compounds are shown in Table 3-1.

3.2 PHYSICAL AND CHEMICAL PROPERTIES

The physical and chemical properties of various vanadium compounds are shown in Table 3-2.

TABLE 3-1. Chemical Identity of Vanadium and Compounds^a

Characteristic	Vanadium	Vanadium pentoxide	Vanadyl sulfate	Sodium metavanadate
Synonyms	Vanadium-51	Vanadic anhydride; divanadium pentoxide; divanadium pentoxide; vanadium oxide; vanadic acid; vanadic acid anhydride ^{b,c}	Vanadium oxysulfate; oxysulfato vanadium; vanadium oxide sulfate; vanadium oxosulfate; oxo (sulfat (2-)-0)-vanadium ^{e,d}	Vanadic acid; monosodium salt ^d
Trade names	No data	CI 77938	CI 77940	No data
Chemical formula	V	V ₂ O ₅ ^c	VOSO ₄ ^d	NaVO ₃ ^d
Chemical structure	V ^f	$\begin{array}{c} \text{O} \\ \parallel \\ \text{V} - \text{O} - \text{V} \\ \parallel \quad \parallel \\ \text{O} \quad \text{O} \end{array}$	O=V ²⁺ (SO ₄) ⁻²	$\text{Na}^+ \text{O}^- - \text{V} \begin{array}{l} \diagup \text{O} \\ \diagdown \text{O} \end{array}$
Identification numbers:				
CAS registry	7440-62-2 ^g	1314-62-1 ^h	27774-13-3 ^b	13718-26-8 ^d
NIOSH RTECS	YW1355000 ^d	YW2450000	YW1925000 ^d	YW1050000 ^d
EPA hazardous waste	No data	P120	No data	No data
ORM/TADS	No data	7217394	7216945 ^d	No data
DOT/UN/NA/IMCO shipping	No data	DOT/UN2862 ^b	NA 9152; UN2931 ^d	No data
HSDB	1022	1024	1026	No data
NCI	No data	No data	No data	No data

TABLE 3-1 (Continued)

Characteristic	Sodium orthovanadate	Ammonium metavanadate
Synonyms	Vanadic (II) acid; trisodium salt; sodium vanadate; sodium vanadate oxide; trisodium orthovanadate ^d	Ammonium vanadate; vanadic acid; ammonium salt
Trade names	No data	No data
Chemical formula	Na ₃ VO ₄ ^d	NH ₄ VO ₃
Chemical structure	$\begin{array}{c} \text{Na}^+\text{O}^- \\ \diagdown \\ \text{V} \\ \diagup \\ \text{O}^- \text{Na}^+ \end{array} \begin{array}{c} \text{O} \\ \parallel \\ \text{O} \end{array}$	$\begin{array}{c} \text{H} \\ \\ \text{H} - \text{N}^+ - \text{H} \text{O}^- - \text{V} \\ \\ \text{H} \end{array} \begin{array}{c} \text{O} \\ \parallel \\ \text{O} \end{array}$
Identification numbers:		
CAS registry	13721-39-6 ^d	7803-55-6
NIOSH RTECS	YW1120000 ^d	YW0875000 ^d
EPA hazardous waste	No data	P119
OHM/TADS	No data	No data
DOT/UN/NA/IMCO shipping	No data	UN 2859 ^d
HSDB	No data	6310
NCI	No data	No data

^aAll information obtained from HSDB 1990 except where noted

^bSax 1988

^cWindholz 1989

^dRTECS 1989

^eHawley 1977

^fPossible valence states: 1-, 0, 2+, 3+, 4+, 5+

^gGrayson 1989

^hNIOSH 1985

CAS = Chemical Abstracts Services; DOT/UN/NA/IMCO = Department of Transportation/United Nations/North America/International Maritime Dangerous Goods Code; EPA = Environmental Protection Agency; HSDB = Hazardous Substances Data Bank; NCI = National Cancer Institute; NIOSH = National Institute for Occupational Safety and Health; OHM/TADS = Oil and Hazardous Materials/ Technical Assistance Data System; RTECS = Registry of Toxic Effects of Chemical Substances

TABLE 3-2. Physical and Chemical Properties of Vanadium and Compounds^a

Property	Vanadium	Vanadium pentoxide	Vanadyl sulfate	Sodium metavanadate
Molecular weight	50.942 ^b	181.9 ^c	163.0 ^c	121.93 ^b
Color	Light grey or white lustrous ^c	Yellow to rust brown crystals ^c	Blue ^c	Colorless ^b
Physical state	Powder or crystal ^c	Crystals ^c	Crystalline powder ^c	Crystals ^b
Melting point	1,890 ± 10°C; 1,917°C ^{b,c}	690°C ^c	No data	630°C ^b
Boiling point	3380°C ^b	1,750°C (decomposes) ^d	No data	No data
Density	6.11g/cm ³ at 18.7°C ^c	3.357 g/cm at 18°C	No data	No data
Odor	No data	Odorless ^a	Odorless ^d	No data
Odor threshold:				
Water	No data	No data	No data	No data
Air	No data	No data	No data	No data
Solubility:				
Water at 20°C	Insoluble ^c	1 g/125 mL ^c	Soluble ^c	211 g/L at 25°C; 388 g/L at 75°C ^f
Organic solvents	No data	Soluble in acetone; insoluble in alcohol ^c	No data	No data
Partition coefficients:				
Log octanol/water K _{ow}	No data	No data	No data	No data
Log K _{oc}	No data	No data	No data	No data
Vapor pressure	No data	0 mmHg ^a	No data	No data
Henry's law constant	No data	No data	No data	No data
Autoignition temperature	No data	Not flammable	No data	No data
Flashpoint	No data	Not flammable	Not flammable ^d	No data
Flammability limits	No data	Not flammable	Not flammable ^d	No data
Conversion factors	No data	No data	No data	No data
Explosive limits	No data	No data	No data	No data

TABLE 3-2 (Continued)

Property	Sodium orthovanadate	Ammonium metavanadate
Molecular weight	183.91; 183.94 ^{b,1}	116.98 ^b
Color	Colorless ^b	White-yellowish or colorless ^b
Physical state	Hexagonal prisms ^g	Crystals ^b
Melting point	850°C-856°C ^b	200°C (decomposes) ^b
Boiling point	No data	No data
Density	No data	2.326 g/cm ³ at 20°C ^b
Odor	No data	No data
Odor threshold:		
Water	No data	No data
Air	No data	No data
Solubility:		
Water	Soluble in water ^b	Slightly soluble ^b
Organic solvent	Insoluble in alcohol ^h	Insoluble in alcohol, ether ^f
Partition coefficients:		
Log octanol/water K _{ow}	No data	No data
Log K _{oc}	No data	No data
Vapor pressure	No data	No data
Henry's law constant	No data	No data
Autoignition temperature	No data	Not flammable
Flashpoint	No data	Not flammable
Flammability limits	No data	Not flammable
Conversion factors	No data	No data
Explosive limits	No data	No data

^aAll information obtained from HSDB 1990 unless otherwise noted.

^bGrayson 1983

^cWindholz 1983

^dWeiss 1986

^eNIOSH 1985

^fStokinger 1981

^gSax 1988

^hWeast 1983

¹RTECS 1989

