3. CHEMICAL AND PHYSICAL INFORMATION

3.1 CHEMICAL IDENTITY

The synonyms and identification numbers for silver and selected silver compounds are listed in Tables 3-1 through 3-6.

3.2 PHYSICAL AND CHEMICAL PROPERTIES

Important physical and chemical properties of silver and selected silver compounds are given in Tables 3-7 through 3-12.

3. CHEMICAL AND PHYSICAL INFORMATION

TABLE 3-1. Chemical Identity of Silver

	Value	Reference
Chemical name	Silver	
Synonyms	Silver; argentum; argentum crede; *CI 77820*; shell silver; silver atom; silver colloidal; silflake; silpowder; silber	CHEMLINE 1988; *HSDB 1988*
Trade names	No data	
Chemical formula	Ag	Grayson 1983; Windholz 1983
Chemical structure	Ag	HSDB 1988
Wiswesser	• Ag	HSDB 1988
Identification numbers:		
CAS Registry	7440-22-4	HSDB 1988
NIOSH RTECS	VW 3500000	HSDB 1988
EPA Hazardous Waste	D011	HSDB 1988
OHM/TADS	7216881	HSDB 1988
DOT/UN/NA/IMCO shipping	No data	
HSDB	5034	HSDB 1988
NCI	No data	
STCC	No data	

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

3. CHEMICAL AND PHYSICAL INFORMATION

TABLE 3-2. Chemical Identity of Silver Nitrate

	Value	Reference
Chemical name	Silver nitrate	
Synonyms	Lunar caustic; fused silver nitrate; molded silver nitrate; argenti; nitras; nitric acid silver (I) salt; nitric acid silver (1+) salt; Silver (1+) nitrate	HSDB 1988; Weiss 1986; Windholz
Trade names	No data	
Chemical formula	$AgNO_3$	Grayson 1983; Weiss 1986
Chemical structure	$Ag^+ \ NO_3^-$	HSDB 1988
Wiswesser	AG N-03	HSDB 1988
Identification numbers:		
CAS Registry	7761-88-8	Grayson 1983; Weiss 1986
NIOSH RTECS	VW 4725000	HSDB 1988
EPA Hazardous Waste	No data	
OHM/TADS	7216883	HSDB 1988
DOT/UN/NA/IMCO shipping	DOT 1493 UN 1493 IMCO 5.1	Weiss 1986 HSDB 1988
HSDB	685	HSDB 1988
NCI	No data	
STCC	49 187 42	HSDB 1988

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

3. CHEMICAL AND PHYSICAL INFORMATION

TABLE 3-3. Chemical Identity of Silver (I) Oxide

	Value	Reference
Chemical name	Silver (I) oxide	
Synonyms	Argentous oxide; silver (1+) oxide; disilver oxide; silver oxide	Windholz 1983
Trade names	No data	
Chemical formula	Ag_2O	Grayson 1983; Weiss 1986
Chemical structure	$Ag^+ \ O^{2-} \ Ag^+$	RTECS 1989
Wiswesser	AG 2-0	RTECS 1989
Identification numbers:		
CAS Registry	20667-12-3	Grayson 1983
NIOSH RTECS	VW 4900000	RTECS 1989
EPA Hazardous Waste	No data	
OHM/TADS	No data	
DOT/UN/NA/IMCO shipping	IMO/UN-not listed	Weiss 1986
HSDB	No data	
NCI	No data	
STCC	No data	

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

3. CHEMICAL AND PHYSICAL INFORMATION

TABLE 3-4. Chemical Identity of Silver (II) Oxide

	Value	Reference
Chemical name	Silver (II) oxide	
Synonyms	Argentic oxide; silver peroxide; silver suboxide; divasil	Windholz 1983
Trade names	No data	
Chemical formula	AgO	Grayson 1983
Chemical structure	Ag^{2+} O^{2-}	Grayson 1983
Wiswesser	No data	
Identification numbers:		
CAS Registry	1301-96-8, 35366-11-1	Grayson 1983
NIOSH RTECS	No data	
EPA Hazardous Waste	No data	
OHM/TADS	No data	
DOT/UN/NA/IMCO shipping	No data	
HSDB	No data	
NCI	No data	
STCC	No data	

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

3. CHEMICAL AND PHYSICAL INFORMATION

TABLE 3-5. Chemical Identity of Silver Sulfide

	Value	Reference
Chemical name	Silver sulfide	
Synonyms	Acanthite; argentous sulfide	Weast 1988 Windholz 1983
Trade names	No data	
Chemical formula	Ag_2S	Grayson 1983
Chemical structure	Ag^+ S^{2-} Ag^+	Windholz 1983
Wiswesser	No data	
Identification numbers:		
CAS Registry	21548-73-2	Grayson 1983
NIOSH RTECS	No data	
EPA Hazardous Waste	No data	
OHM/TADS	No data	
DOT/UN/NA/IMCO shipping	No data	
HSDB	No data	
NCI	No data	
STCC	No data	

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

3. CHEMICAL AND PHYSICAL INFORMATION

TABLE 3-6. Chemical Identity of Silver Chloride

	Value	Reference
Chemical name	Silver chloride	
Synonyms	Silver (I) chloride; Silver monochloride	RTECS 1988
Trade names	No data	
Chemical formula	AgCl	Grayson 1983
Chemical structure	Ag^+ Cl^-	RTECS 1988
Wiswesser	No data	
Identification numbers:		
CAS Registry	7783-90-6	Grayson 1983
NIOSH RTECS	VW 3563000	RTECS 1988
EPA Hazardous Waste	No data	
OHM/TADS	No data	
DOT/UN/NA/IMCO shipping	No data	
HSDB	No data	
NCI	No data	
STCC	No data	

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

3. CHEMICAL AND PHYSICAL INFORMATION

TABLE 3-7. Physical and Chemical Properties of Silver

	Value	Reference
Molecular weight	107.868	Weast 1988
Color	Lustrous, white	Weast 1988
Physical state	Solid metal	Grayson 1983
Valence state	+1,+2	Windholz 1983
Melting point	961.93°C	Weast 1988
Boiling point	2,212°C at 760 mmHg	Weast 1988
Density at 20°C	10.50 g/cm^3	Weast 1988
20°C	10.43 g/cm^3 (hard drawn)	Grayson 1983
20°C	10.49 g/cm^3 (annealed	Grayson 1983
Odor	No data	
Odor threshold:		
Water	No data	
Air	No data	
Solubility:		
Water at 20°C	Insoluble; soluble in nitric acid, not in sulfuric acid and alkali cyanide solutions	Windholz 1983; ITII 1982
Organic solvents	No data	
Partition coefficients	No data	
Vapor pressure:		
Liquid silver at 1,865°C	100 mmHg	Weast 1988
Henry's law constant	No data	
Autoignition temperature	No data	
Flashpoint	No data	
Flammability limits	Dust is moderately flammable	ITII 1982
Conversion factors	Troy ounces x 31.1034768 = grams	Weast 1988

3. CHEMICAL AND PHYSICAL INFORMATION

TABLE 3-8. Physical and Chemical Properties of Silver Nitrate

	Value	Reference
Molecular weight	169.89	Weast 1988
Color	Colorless or white	Grayson 1983
Physical state	Solid crystalline	Weast 1988
Melting point	212°C	Grayson 1983
Boiling point	Decomposes at 440°C	Grayson 1983
Density at 19°C	4.35	HSDB 1988
at 19°C	4.33	Weiss 1986
Odor	Odorless	Weiss 1986
Odor threshold:		
Water	No data	
Air	No data	
Solubility:		
Water at 0°C	122 g/100 mL H_2O at 0°C	HSDB 1988
Organic solvents	Soluble in ethanol and acetone	Grayson 1983
Partition coefficients	No data	
Vapor pressure	No data	
Henry's law constant	No data	
Autoignition temperature	Not flammable	Weiss 1986
Flashpoint	Not flammable	Weiss 1986
Flammability limits	Not flammable	Weiss 1986

3. CHEMICAL AND PHYSICAL INFORMATION

TABLE 3-9. Physical and Chemical Properties of Silver (I) Oxide

	Value	Reference
Molecular weight	231.8	Weiss 1986
Color	Dark brown-to-black	Windholz 1983
Physical state	Solid crystalline	Weast 1988; Weiss 1986; Windholz 1983
Melting point	Decomposes at 230°C	Weast 1988
Boiling point	Decomposes between 200°-300°C	Windholz 1983
	Decomposition complete at 300°C	Grayson 1983
Density at 20°C	7.14 g/cm^3	Weiss 1986
Odor	Odorless	Weiss 1986
Odor threshold:		
Water	No data	
Air	No data	
Solubility:		
Water at 25°C	$2.2x10^{-2}$ g/L	Grayson 1983
Organic solvents	Practically insoluble in alcohol	Windholz 1983
Partition coefficients	No data	
Vapor pressure	No data	
Henry's law constant	No data	
Autoignition temperature	No data	
Flashpoint	Not flammable	Weiss 1986
Flammability limits	Not flammable	Weiss 1986

3. CHEMICAL AND PHYSICAL INFORMATION

TABLE 3-10. Physical and Chemical Properties of Silver (II) Oxide

	Value	Reference
Molecular weight	123.88	Windholz 1983
Color	Charcoal gray powder, black crystal	Grayson 1983; Windholz 1983
Physical state	Solid	Windholz 1983
Melting point	No data	
Boiling point	Decomposes above 100°C	Windholz 1983
Density	No data	
Odor	No data	
Odor threshold:		
Water	No data	
Air	No data	
Solubility:		
Water at 20°C	Decomposes in aqueous solution	Windholz 1983
Organic solvents	No data	
Partition coefficients:	No data	
Vapor pressure	No data	
Henry's law constant	No data	
Autoignition temperature	No data	
Flashpoint	No data	
Flammability limits	No data	

TABLE 3-11. Physical and Chemical Properties of Silver Sulfide

	Value	Reference
Molecular weight	247.80	Weast 1988
Color	Gray-black	Weast 1988
Physical state	Solid	Grayson 1983
Melting point	No data	
Boiling point	Decomposes at 810°C	Grayson 1983
Density at 20°C	7.326 g/cm^3	Weast 1988
Odor	No data	
Odor threshold:		
Water	No data	
Air	No data	
Solubility:		
Water at 20°C	$1.4x10^{-4}$ g/L	Grayson 1983
Organic solvents	No data	
Partition coefficients	No data	
Vapor pressure	No data	
Henry's law constant	No data	
Autoignition temperature	No data	
Flashpoint	No data	
Flammability limits	No data	

3. CHEMICAL AND PHYSICAL INFORMATION

TABLE 3-12. Physical and Chemical Properties of Silver Chloride

	Value	Reference
Molecular weight	143.34	Windholz 1983
Color	White	Windholz 1983
Physical state	Solid	Windholz 1983
Melting point	455°C	Windholz 1983
Boiling point	1,550°C	Windholz 1983
Density at 20°C	5.56 g/cm^3	Windholz 1983
Odor	No data	
Odor threshold:		
Water	No data	
Air	No data	
Solubility:		
Water at 25°C	1.93 mg/L	Windholz 1983
Organic solvents	No data	
Partition coefficients	No data	
Vapor pressure		
Henry's law constant	No data	
Autoignition temperature	No data	
Flashpoint	No data	
Flammability limits	No data	