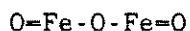


Ref

1. NAME: Ferric Oxide, Hematite, Iron (III) Oxide

2. STRUCTURE:



Empirical Formula: Fe_2O_3

CAS Registry No. 1309-37-1

3. PHYSICAL PROPERTIES:

Physical State: Solid 1

Color: Reddish brown to black 1

Molecular Weight: 0.15969 kg/mol (159.69 g/mol) 1

Oxygen Balance:

Density (ρ): 5.24 Mg/m³ (5.24 g/cm³) 1

M.P.: 1838 K (1565°C) 1

Glass Transition Temperature (T_g): K

Flash Point: K

B.P.: K (°C)

Critical Temperature: K

Critical Pressure: Pa

V.P.: Pa at K

Compressability: m²/N

Speed of Sound: m/s

Sublimation Temperature: K

Viscosity: N·s/m² at K

Volatility: kg/(m²·s)

Approved for public release; distribution is unlimited.

Ref

Solubility: (s-sol, sl-slight, i-insol, d-decomp) 1
s- sulfuric acid, hydrochloric acid
sl-
i- water
d-

Hardness: dimensionless (Mohs or Brinell Scale)
kg/m² (Knoop)

Hygroscopicity: % wt. gain at K and %RH

Poisson's Ratio: dimensionless

Modulus of Elasticity: Pa

Tensile Strength: Pa

Acoustic Impedance: kg/(m²·s)

pH: dimensionless

Hydrolysis Constants:

Hydrolysis Test: h forms % acid

Spectra:

IR - see F-01 in Section 9

Raman -

NMR -

X-ray Photoelectron -

Optical Absorption -

Photoconductivity -

GLC Retention Data:

4. THERMAL PROPERTIES:

Heat of Formation (ΔH°_f): -824 kJ/mol (-197 kcal/mol) 2,7

Heat of Fusion (ΔH°_m): J/mol

Heat of Combustion (ΔH°_c): J/mol

Heat of Evaporation (ΔH°_v): J/mol

Heat of Sublimation (ΔH°_s): J/mol

Ref

Heat of Explosion (ΔH°_{ex}):	J/mol	:	H ₂ O (l)	
	J/mol	:	H ₂ O (g)	
Heats of Transition (ΔH°_t) and Transition Temperatures:				1
	α : 0.67 kJ/mol at 950 K (0.16 kcal/mol at 677°C)			
	β : 0 kJ/mol at 1050 K			
	γ : decomposes			
Heat Capacity: (C_p°):	0.650 kJ/(kg•K) (24.8 cal/mol•K)			2,7
	0.7502 kJ/(kg•K) (0.1793 cal/g•K)			3
Thermal Conductivity (k):	0.590 W/(m•K) at 473 K			
	(1.41 x 10 ⁻³ g•cal/s•cm ² •°C/cm at 200°C)			2
Thermal Diffusivity (α):	17.5 mm ² /s at 318-373 K			
	(1.75 x 10 ⁻³ cm ² /s at 318-373 K)			4
Coefficient of Thermal Expansion (α):	9.38-11.75 x 10 ⁻⁶ K ⁻¹			
	(β): /K at K			5
Autoignition Temperature:	K			
Thermal Stability:				
DTA: exotherm:	onset at K			
	exotherm: peak at K			
TGA: (Heating Rate of	K/s):	wt. %/	K	
DSC: (Heating Rate of	K/s):	exotherm onset at	K	
		exotherm peak at	K	
KI-Starch Test at 355.4 K (82.2°C):			s	
KI-Starch Test at 338.7 K (65.5°C):			s	
Methyl Violet Test 393 K (120°C):			s	
Taliani Test at 383 K (110°C):		s to reach 13.3 kPa		
		(100 mm) pressure		
Heat Test at 373 K (100°C):	% loss in		s	
Heat Test at 393 K (120°C):	Salmon Pink, Red Fumes, Explosion, etc.,			
	in		s	
Heat Test at 407.65 K (134.5°C):	Salmon Pink, Red Fumes, Explosion,			
	etc., in		s	

Ref

Chemical Reactivity Test (CRT): m^3/kg in s at K

Vacuum Test: m^3/kg in s at K

5. CRYSTAL AND OPTICAL PROPERTIES:

Crystalline Form: Trigonal 7

Refractive Index (η_D): 3.01(Na), 2.94(Li) 1

Optical Rotation: + or - dimensionless

Unit Cell Dimensions: a= nm ($\times 10^{-8}$ cm)
b= nm ($\times 10^{-8}$ cm)
c= nm ($\times 10^{-8}$ cm)

Lattice Energy: kJ/mol (calc.)

Birefringence: dimensionless

Molar Refraction (R): dimensionless

6. ELECTRICAL PROPERTIES:

Magnetic Susceptibility (K): $35.86 \times 10^{-9} \text{ m} \cdot \text{kg} \cdot \text{s}$ at 1033 K 1
($3586 \times 10^{-6} \text{ cm} \cdot \text{g} \cdot \text{s}$)

Electrical Resistivity: $\Omega \cdot \text{m}$ at K

First Ionization Potential: eV

Hall Coefficient: see Figure or m^3/C

Dielectric Constant (ϵ) at Hz, K: dimensionless

7. EXPLOSIVE AND SENSITIVITY PROPERTIES

Detonation Velocity: m/s

C-J Pressure: Pa

C-J Temperature: K

Lead Block Expansion Test (PA - 100): dimensionless

(TNT - 100): m^3/kg if PA or TNT
values not given

Ref

Ballistic Mortar (TNT = 100): dimensionless

Sensitivity to Initiation (min. wt. of detonating charge):

Lead Azide: g

Tetryl: g

Mercury Fulminate: g

Brisance:

Plate Dent Test (TNT = 100): dimensionless

Lead Block Compression Test (TNT = 100): dimensionless

Copper Cylinder Compression Test (TNT = 100): dimensionless

200 g Sand Test: Partial Explosion, No Reaction, etc., or (NG = 100):

Impact Sensitivity: N·m

BuMines: m with a kg weight (type of plates, if known)

Cavity Drop (50% fire):

PA: m with a kg weight (type of plate, if known)

SRI: g·m

Electrostatic Sensitivity: negative at J

Friction Sensitivity:

ABL Sliding Friction Test: N

Esso Screw Friction Test: no reaction, explosives (grit, glass, diamond)

Mortar and Pestle: no reaction w kp pestle load

Friction Pendulum Test: with steel shoe
with fiber shoe

Confined "Cook-off" Temp.: K

Copper Block Test: K/s : fume-off, etc. at K

Explosion Temp.: K

Ref

Critical Diameter (d_c): m

Shock Sensitivity:

Wedge Test (% PETN threshold):

LVD: dimensionless

HVD: dimensionless

Card Gap Test (# of cards or mm of distance):

LVD: dimensionless

HVD: dimensionless

8. HAZARDS:

Toxicity:

Humans: TLV-TWA: 5 mg/m³ in air

9

TLV-STEL: 10 mg/m³ in air

LD50 (mice): mg/kg (intraperitoneal and/or intragastric)

(rats): mg/kg (intraperitoneal and/or intragastric)

DoT Hazards Classification:

Hazard Class (Quantity-Distance): Class #

Dust Explosion Characteristics:

ignition temperature of dust cloud: K

minimum ignition energy: J

minimum explosive concentration: kg/m³

maximum explosive pressure: Pa

maximum rate of pressure rise: Pa/s

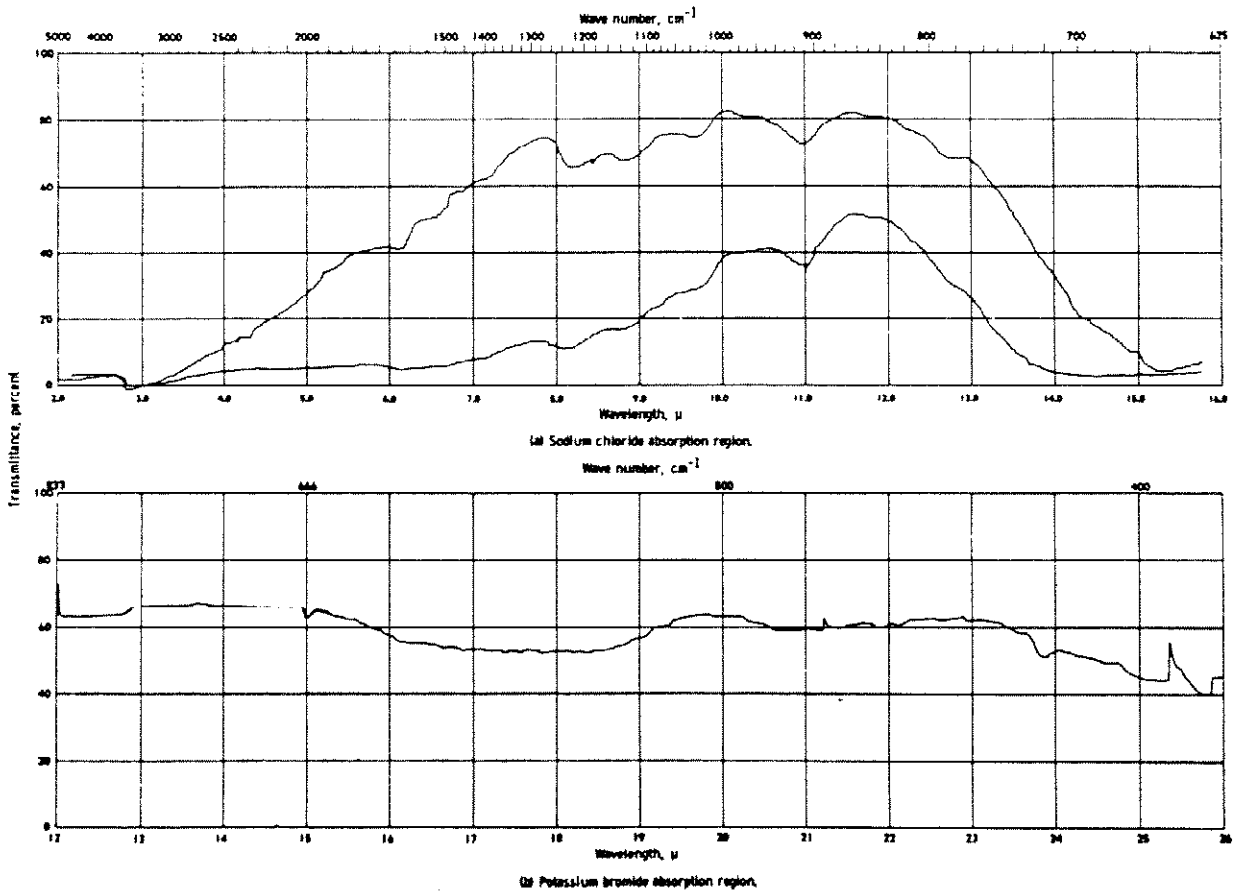
terminal oxygen concentration: %

relative explosive hazard:

Fire Hazard:

Ref

9. FIGURES:



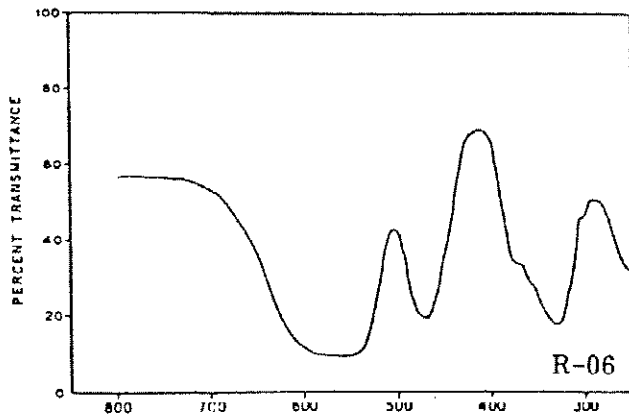
(R-08)

F-01. Infrared spectra of ferric oxide (Fe_2O_3) through NaCl and KBr prisms
(See also Note in Section 11)

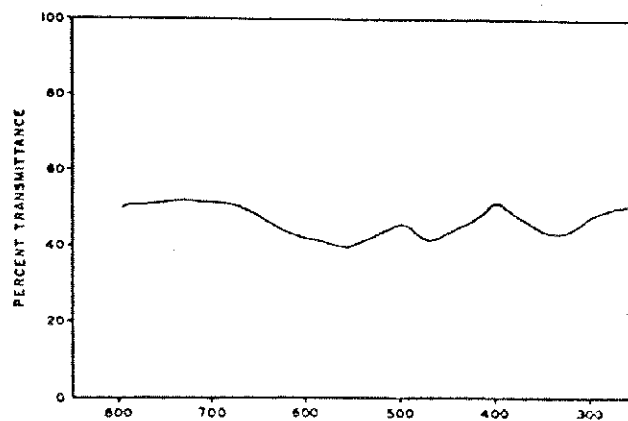
9. FIGURES (Cont'd)

Ref

$\alpha\text{Fe}_2\text{O}_3$



$\gamma\text{Fe}_2\text{O}_3$



(R-06)

F-02. Infrared spectra of α and γ Fe_2O_3

10. TABLES:

11. NOTES:

The instrument used to obtain the IR spectra in F-01 was a Baird-Atomic NK-1 double-beam recording spectrophotometer utilizing a cam and prism interchange to cover the wavelength region from 2 to 26 microns. With a sodium chloride prism the instrument covered the range from 2 to 16 microns; with the potassium bromide prism and cam interchange, the region from 12 to 26 microns was studied.

12. MILITARY SPECIFICATIONS:

13. REFERENCES:

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Data Compiled by T. D. Wilson