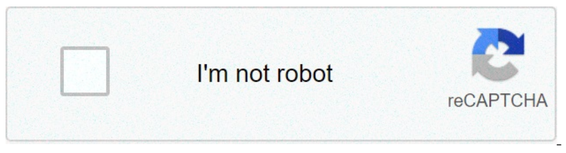

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Decomposition reaction of hgo

This is an oxidation-reduction (redox) reaction:2 HgII + 4 e- → 2 Hg0 (reduction)2 O-II - 4 e- → 2 O0 (oxidation)HgO is an oxidizing agent, HgO is a reducing agent. Learning Objectives Describe ways a chemical reaction can be recognized. Have you ever cooked a pizza? Making a pizza can be as easy as buying a “take and bake” from a store and putting it in the oven to mixing up the dough and loading it up with your favorite toppings before baking it. How do you know when it is done? The most obvious sign is that the crust turns light brown. The dough is no longer flexible, but much more solid. Maybe the cheese has melted. You want the pizza to be cooked, not half-raw. How can you tell if a chemical reaction is taking place? There are four visual clues that indicate that a chemical reaction is likely occurring. A change of color occurs during the reaction. A gas is produced during the reaction. A solid product called a precipitate is produced in the reaction. A transfer of energy occurs as a result of the reaction. Mercury(II) oxide is a red solid. When it is heated to a temperature above 500°C, it easily decomposes into mercury and oxygen gas. The red color of the mercury oxide reactant becomes the silver color of mercury. The color change is the sign that the reaction is occurring. Figure 2.19 Mercuric oxide. Figure 2.20 Mercury metal. When zinc reacts with hydrochloric acid, the reaction bubbles vigorously as hydrogen gas is produced. The production of a gas is also an indication that a chemical reaction is occurring. Figure 2.21 Zinc reacting with hydrochloric acid produces bubbles of hydrogen gas. When a colorless solution of lead(II) nitrate is added to a colorless solution of potassium iodide, a yellow solid called a precipitate is instantly produced. A precipitate is a solid product that forms from a reaction and settles out of a liquid mixture. The formation of a precipitate is an indication of a chemical reaction. Figure 2.22 A yellow precipitate of solid lead(II) iodide forms immediately when solutions of lead(II) nitrate and potassium iodide are mixed. All chemical changes involve a transfer of energy. When zinc reacts with hydrochloric acid, the test tube becomes very warm as energy is released during the reaction. Some other reactions absorb energy. While energy changes are a potential sign of a chemical reaction, care must be taken to ensure that a chemical reaction is indeed taking place. Physical changes also involve a transfer of energy. Melting of a solid absorbs energy, while the condensation of a gas releases energy. The only way to be certain that a chemical reaction has taken place is to test the composition of the substances after the change has taken place to see if they are different from the starting substances. Summary There are four visual clues that indicate that a chemical reaction is likely occurring. A change of color occurs during the reaction. A gas is produced during the reaction. A solid product called a precipitate is produced in the reaction. A transfer of energy occurs as a result of the reaction. Questions Use the link below to answer the following questions: What happened when the yellow solution and the clear solution were mixed? What happened when the chalk was added to the clear liquid? How much did the temperature change when two liquids were mixed together? Questions What was the color change when mercury (II) oxide was heated? What happened when zinc metal was mixed with hydrochloric acid? What happens when lead nitrate and potassium iodide are mixed? Glossary chemical reaction: Involves a transfer of energy. There are four visual clues to indicate a chemical reaction. gas: A state of matter that is air-like, with a low density and viscosity. precipitate: A substance that is created from a precipitation reaction. Decomposition Reactions Essentially, decomposition reaction are the opposite of combination reactions. A compound decomposes (i.e.,"splits-up") into two or more compounds and/or elements. For example mercury(II) oxide will, upon heating, decompose into mercury metal and oxygen: Since heat had to be added to make this reaction go, it is an endothermic reaction. Most decomposition reactions are endothermic. Another example of a decomposition reaction is the heating of calcium carbonate (sea shells, chalk): Mercury(II) oxide Names IUPAC name Mercury(II) oxide Other names Mercuric oxideMontroyditeRed mercury Identifiers CAS Number 21908-53-2 Y 3D model (JSmol) Interactive image ChemSpider 28626 Y ECHA InfoCard 100.040.580 KEGG C18670 Y PubChem CID 30856 RTECS number OW8750000 UNII IY191986AO Y UN number 1641 CompTox Dashboard (EPA) DTXSID4042125 InChI InChI=1S/Hg.O YKey: UKWHYYKOEPRTIC-UHFFFAOYSA-N Y SMILES [Hg]=O Properties Chemical formula HgO Molar mass 216.591 g·mol−1 Appearance Yellow or red solid Odor odorless Density 11.14 g/cm3 Melting point 500 °C (932 °F; 773 K) (decomposes) Solubility in water 0.0053 g/100 mL (25 °C) 0.0395 g/100 mL (100 °C) Solubility insoluble in alcohol, ether, acetone, ammonia Band gap 2.2 eV[1] Magnetic susceptibility (χ) −44.0·10−6 cm3/mol Refractive index (nD) 2.5 (550 nm)[1] Structure Coordination geometry orthorhombic Thermochemistry Std molarentropy (So298) 70 J·mol−1·K−1[2] Std enthalpy offormation (ΔfH298) −90 kJ·mol−1[2] Hazards Main hazards Highly toxic Safety data sheet ICSC 0981 GHS pictograms NFPA 704 (fire diamond) 4 0 2 Flash point Non-flammable Lethal dose or concentration (LD, LC): LD50 (median dose) 18 mg/kg (oral, rat)[3] Related compounds Other anions Mercury sulfideMercury selenideMercury telluride Other cations Zinc oxideCadmium oxide Related compounds Mercury(I) oxide Except where otherwise noted, data are given for materials in their standard state (at 25 °C [77 °F], 100 kPa). N verify (what is YN ?) Infobox references Chemical compound Mercury(II) oxide, also called mercuric oxide or simply mercury oxide, has a formula of HgO. It has a red or orange color. Mercury(II) oxide is a solid at room temperature and pressure. The mineral form montroydite is very rarely found. History See also: Maslama al-Majriti In 1774, Joseph Priestley discovered that oxygen was released by heating mercuric oxide, although he did not identify the gas as oxygen (rather, Priestley called it "dephlogisticated air," as that was the paradigm that he was working under at the time).[4] Synthesis Montroydite structure (red atoms are oxygens) Cinnabar structure The red form of HgO can be made by heating Hg in oxygen at roughly 350 °C, or by pyrolysis of Hg(NO3)2.[5] The yellow form can be obtained by precipitation of aqueous Hg2+ with alkali.[5] The difference in color is due to particle size, both forms have the same structure consisting of near linear O-Hg-O units linked in zigzag chains with an Hg-O-Hg angle of 108°.[5] Structure Under atmospheric pressure mercuric oxide has two crystalline forms: one is called montroydite (orthorhombic, 2/m 2/m 2/m, Pnma), and the second is analogous to the sulfide mineral cinnabar (hexagonal, hP6, P3221); both are characterized by Hg-O chains.[6] At pressures above 10 GPa both structures convert to a tetragonal form.[1] Uses HgO is sometimes used in the production of mercury as it decomposes quite easily. When it decomposes, oxygen gas is generated. It is also used as a material for cathodes for mercury batteries.[7] Health issues The label on an HgO powder bottle. Mercury oxide is a highly toxic substance which can be absorbed into the body by inhalation of its aerosol, through the skin and by ingestion. The substance is irritating to the eyes, the skin and the respiratory tract and may have effects on the kidneys, resulting in kidney impairment. In the food chain important to humans, bioaccumulation takes place, specifically in aquatic organisms. The substance is banned as a pesticide in the EU.[8] Evaporation at 20 °C is negligible. HgO decomposes on exposure to light or on heating above 500 °C. Heating produces highly toxic mercury fumes and oxygen, which increases the fire hazard. Mercury(II) oxide reacts violently with reducing agents, chlorine, hydrogen peroxide, magnesium (when heated), disulfur dichloride and hydrogen trisulfide. Shock-sensitive compounds are formed with metals and elements such as sulfur and phosphorus.[9] References ^ a b c "Mercury oxide (HgO) crystal structure, physical properties". Semiconductors · II-VI and I-VII Compounds; Semimagnetic Compounds. Landolt-Börnstein – Group III Condensed Matter. Landolt-Börnstein - Group III Condensed Matter. 41B. Springer-Verlag. 1999. pp. 1–7. doi:10.1007/b71137. ISBN 978-3-540-64964-9. ^ a b Zumdahl, Steven S. (2009). Chemical Principles 6th Ed. Houghton Mifflin Company. p. A22. ISBN 978-0-618-94690-7. ^ Chambers, Michael. "ChemIDplus - 21908-53-2 - UKWHYYKOEPRTIC-UHFFFAOYSA-N - Mercuric oxide [ISO] - Similar structures search, synonyms, formulas, resource links, and other chemical information". chem.sis.nlm.nih.gov. ^ Almqvist, Ebbe (2003). History of Industrial Gases. Springer. p. 23. ISBN 978-0-306-47277-0. ^ a b c Greenwood, Norman N.; Earnshaw, Alan (1997). Chemistry of the Elements (2nd ed.). Butterworth-Heinemann. 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Retrieved from " Transcribed image text: Determine the temperature at which the following decomposition reaction HgO (s)--> Hg (l) + (g) becomes spontaneous, kJ mol- kJ mol-I SJ mol- K- C‖J mol-' K- formula as 619.2 61.4 as 20.8 28.0 20.8 2 um 186.9 Hafnium oxide 1088.2 0.0 31.8 75.9 175.0 -101.7 44.1 Higo,s Mercury(II)sulfate Mercury(II) sulfide Mercury(II) telluride 48.4 108.8 288.1 37.4 4 5 5 Hg,O,S Mercury(I) sulfate 200.7 132.0 STANDARD THERMODYNAMIC PROPERTIES OF CHEMICAL SUBSTANCES (continued 2 5 109967415256 900 57 sa. 50. 26, 9903 25 2.5 3-4042 3 63 34 5 15 -45153 Ayo A. asked • 12/09/18 Suppose 28.0 mL of dioxygen gas are produced by this reaction, at a temperature of 80.0*C and pressure of exactly 1 atm. Calculate the mass of mercury(II) oxide that must have reacted. Round your answer to 3 significant digits. 1 Expert Answer

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