


Mno4 2 undergoes disproportionation

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Mno4 2 undergoes disproportionation

Mno4 2 undergoes disproportionation reaction in acidic medium.

This discussion on the following diagram of Latimer, the species that undergoes a disproportionation reaction is: a)b)c)Mn2O3d)Mn(OH)2The answer of the problem is the 'B' option. is made on EduRev Study Group by chemistry students. The questions and answers of the following Latimer diagram, the species that undergoes a disproportionation reaction is: a)b)c)Mn2O3d)Mn(OH)2The rectum response is the 'B' option. Can you explain this answer? are resolved by group of students and teacher of Chemistry, which is also the largest student community of Chemistry. If the answer is not available, please wait a bit and a community member will likely respond to this soon. You can study other questions, MCQ, videos and tests for Chemistry on EduRev and also discuss your questions as In the following Latimer diagram, the species that undergoes a disproportionation reaction is: a)b)c)Mn2O3d)Mn(OH)2The rectum response is the 'B' option. here on EduRev! In addition to being the largest community in Chemistry, EduRev has the largest bank of questions asked for Chemistry. We received your query One of our mentor will return to you within 48 hours. In the meantime you can enjoy the free study material A disproportionation reaction is when a multiatomic species whose relevant element has a specific oxidation state gets oxidized and reduced in two separate semi-reactions, of producing two other products containing the same relevant element. EXAMPLE: MANGANESE OXIDES An affordable example is #“Mn”_2“O”_3# becoming #“Mn”_2“O”_3# becoming #“Mn”_2“O”_3# becoming #“Mn”_2“O”_3# in acid pH has boundary lines that converge, and on both sides of the convergent line is #“Mn”^(2+)# and #“MnO”_2#. In a Pourbaix diagram, this indicates a disproportionation reaction (which, among other things, is spontaneous under pH 4). (Hence, #“MnO”_4^(2-)# may also disproportionately in #“MnO”_2# and #“MnO”_4^(-)#, but in the basic pH.) You could also see in a Frost diagram, although it is a little harder to identify unless you remember how it works. In this case, disproportion occurs from a "hill" point to the points immediately left and right (for example #+3 -> {+2,+4}#). ACTIVITIES We can write half the reactions like this. Reduction: #stackrel(red)(red)(+3)l("Mn")_2stackrel(red color)(-2)l("O")_3(l) -> stackrel(red color)(+2)l("Mn")^(2+)(aq)# This is a reduction from #color(red)(+3)# to #color(red)(+2)#. Now we balance them. Balance the manganese first: #=> "Mn" 2"O" 3(s) -> 2"Mn"^(2+)(aq)# Add water to balance oxygen. (aq) + 3"H" 2"O"(l)# Add protons (since we are in acid pH) to balance hydrogen. (aq) - 2"Mn"^(2+)(aq) + 3"H" 2"O"(l)# Now add the electrons balances the charge. (aq) + 2e^(-) 2"Mn"^(2+)(2+)(aq) + 3"H" 2"O"(l)It is an oxidation from color (red)(+3 again, but to color (red)(+4. Balance the manganese as before. == sync. corrected by elderman == @elder. man Add water to balance oxygen. #=> Mn" 2"O" 3(s) + H" 2"O"(l) -> 2"MnO" 2(s)# and protons to balance hydrogen. #=> Mn" 2"O" 3(s) + H" 2"O"(l) -> 2"MnO" 2(s) + 2"H"^(+)(aq# and electrons to balance the charge. (a) (aq + 2e(#^-) Overall reaction: I'm sorry. All rights reserved What is disproportionation reaction? The redox reaction involving simultaneous oxidation and reduction of the atoms of the same element from a state of oxidation (OS) to two different oxidation states is known as disproportion reaction. Note: The disproportionation reaction is also known as a dismutation reaction. The need for disproportionation reaction is that the disproportionate element must present at least three different oxidation states and the element must be less stable in a particular oxidation state from which it can be oxidized and reduced to relatively more stable oxidation states. Question: How do we know that an element in a particular oxidation state undergoes a disproportionation reaction? When three states of oxidation of an element are written in the increasing order (or decreasing), the element in the central oxidation state should be less stable and the higher and lower oxidation states must be relatively more stable and the overall process must be thermodynamically feasible. Latimer and Frost diagrams are used to predict whether an atom in particular oxidation condition is disproportionate or not (thermodynamic feasibility). In the Latimer diagram, the unstable species that may undergo disproportion has a more positive emf value to its right (by reduction) than emf to its left (by oxidation.) You can also get the same information from Frost diagrams. The chemical species Unstable will be found at a higher point on the plot than the line that connects their neighbors. Dissociation of hydrogen peroxide is a disproportionation reaction. The oxygen atom in H2O2 is in -1 oxidation state. It is oxidized to O2 (ox.st = 0) and reduced to H2O (ox.st = -2.) In the upper reaction to the reflux, relatively less stable peroxide disproportionates in relatively more stable compounds, i.e. water and oxygen. Except fluorine,(Cl2, Br2, I2) are disproportionate in the middle of the alkaline. They form alkali and hypohalite in cold and diluted alkali. For example, chlorine disproportionately to sodium chloride and sodium chloride when treated with cold and diluted sodium hydroxide solution. In the upper disproportion reaction, a chlorine atom is oxidized to +1 while the second is reduced to -1 oxidation states. While, halide and alkaline ions are formed in warm and concentrated alkali. For example, as shown below, when chlorine gas is passed through a warm and concentrated caustic soda solution, it is reduced to ion chloride and oxidized to ion chlorate. In this case, a chlorine atom loses 5 electrons and oxidized to +5 state while the five chlorine atoms are reduced to -1 state accepting an electron each. Bromine and Iodine also show the same behavior in alkaline solutions. However, fluorine does not show disproportionation reactions as it can only exist in two states of oxidation, i.e. 0 and -1 because of its high electronegativeness and very high ionization energies. It cannot be oxidized by any other element. In fact, its most stable oxidation status is -1 and cannot be easily oxidized to the chemically zero oxidation state. Phosphorus disproportionately disproportionates phosphine and hypophosphite in the middle of alkaline. In this case, a P atom is reduced to -3 oxidation number (in PH3) and three P atoms are oxidized to +1 (in NaH2PO2). Mercury chloride undergoes disproportion under UV light to give mercury and mercury chloride. Hg22+ is oxidized to Hg2+ and reduced to Hg. carbon dioxide, NO2 reacts with water to give nitric and nitrous acids (Ostrowald's process). It's a disproportionate reaction. Nitrogen in NO2 is in +4 oxidation status. It is reduced to nitrous acid, HNO2 in which the operating system of nitrogen is +3 and oxidized to nitric acid, HNO3 in which the operating system of nitrogen is +5. Interhalogen compounds, especially XY type, tend to suffer disproportionation reactions. For example, Brominefluoride, BrF disproportionate to Brominetrifluoride, BrF3 and bromine. In the above dismutation reaction, the bromine is oxidized to +3 (as in BrF3) and reduced to 0 oxidation states (as in Br2) by +1 oxidation state as in BrF. Based on the ease of disproportion, the stability of XY-type interhalogen compounds is in order: ClF>ICl>IBr>BrCl>BrF. The Cannizzaro reaction is an example of organic chemistry for disproportionate reaction. In this reaction, aldehydes, without α-hydrogens, in the presence of a strong base, disproportionate to provide alcohol and carboxylic acid. An aldehyde molecule is reduced to the corresponding alcohol, while a second is oxidized to carboxylic acid. 1) Which of these is an example of disproportionate reaction? 1) 4H3PO3 → 3H3PO4 + PH3 2) 2NO2 + H2O → HNO3 + HNO2 3) HgCl2 → Hg + HgCl2 4) Response: 4 2) Which of these is not adisproportionate reaction? A) Cl2 Cl22NaOH → NaCl + NaOCl + H2O B) P4+ 3NaOH + 3H2O = PH3 + 3NaH2PO2 C) 2NaOH + 2F2 → 2NaF + OF2 + H2O D) 2H2O2 → 2H2O + O2 Answer: C Explanation: When fluorine is boiled through cold sodium hydroxide and diluted, it oxidizes the O2- to O2+ (in OF2). 3) What next element does not show the tendency to suffer a disproportionation reaction? A) Oxygen B) Chloride C) Manganese Response: C Explanation: Fluoline does not undergo a disproportionation reaction since it shows only two states of oxidation, i.e. 0 and -1. Related question: Why does fluorescence not show disproportion reactions? 4) Identify disproportion reaction. (Chemistry MCQ IIT JEE NEET) A) 2NO2 + 2OH- → NO2 - + NO3 - + H2O B) CH4 + 4Cl2 → CCl4 + 4HCl C) CH4 + 2O2 → CO2 + 2H2O D) 2NaOH + 2F2 → 2NaF + OF2 + H2O answer: A 5) Which of the following A) Mn2+ B) MnO42- C) MnO4- D) No reply: B Explanation: To undergo disproportion from a particular oxidation state, there should be a higher oxidation state and a lower oxidation state of it. Manganese can show +2 to +7 oxidation states along with the zero oxidation state. From Mn in MnO42- it is already in the upper oxidation level i.e. +7, can not suffer disproportion. Mn2+ ion is stable and cannot disproportionate to the zero oxidation state (lower) and any higher oxidation state (from +3 to +7) as the reaction is not thermodynamically feasible. However, MnO42- ion in which the Mn is in +6 oxidation state can disproportionately disproportionate to +7 and +2 oxidation states and the reaction is also thermodynamically feasible. Related question: MnO42- undergoes a disproportionation reaction in half acid but MnO4- does not. That's right. 6) Disproportion (MCQ) A) A redox reaction in which the atoms of an element from an oxidation state are simultaneously oxidized and reduced. B) A redox reaction that involves the oxidation of atoms of a two-issue element of different oxidation. C) A redox reaction in which the atoms of an element of two oxidation states are reduced and oxidized to a single oxidation state. D) A redox reaction that involves the reduction of atoms of a two-issue element of different oxidation. Answer: A 6) Which of the following elements do not show a disproportionate reaction? A) Mn B) Cu C) Cl D) K Answer: D 7) In life systems, superoxide dismutase, an enzyme catalyzes the disproportion of superoxide, O2- in form: A) H2O + O2- B) H2O2 + O2- C) H2O + O2 D) H2O2 + O2 Response: D Explanation: In the free radical ion superoxide, the state of oxygen oxidation is -1/2. Disproportionate to hydrogen peroxide (O.S. = -1) and oxygen (O.S. = 0). 2 O2- + 2H+ → H2O2 + O2 8) Carbon single-wall nanotubes are produced in the high-pressure carbon monoxide process (HiPco) which involves the Boudouard reaction in which carbon monoxide disproportionate to carbon and carbon dioxide onof nano iron. The change incarbon status is from +2 to: A) 0 & -4 B) 0 & -2 C) 0 & +4 D) 0 & +2 Response: D Explanation: The disproportion reaction of carbon monoxide is: 2CO → C + CO2 9) Consider the change of the state of oxidation of Bromine corresponding to different emf values as shown in the diagram below Then the species that undergoes disproportion is: (NEET 2018) 1) Br2 2) BrO4- 3) BrO3- 4) HBrO Answer: 4 Explanation: The species that undergoes disproportion has a more positive emf value on its right than the emf on the left in the diagram Latimer. In this case, HBrO has a more positive emf value on its right (for the reduction of HBrO to Br2) than emf on its left (for the oxidation of HBrO to BrO3-). So it can suffer disproportion easily. Author: Aditya vardhan Vutturi

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