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Convenient and Easy Methods of Balancing Equations for Redox Reactions

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ABSTRACT

Understanding of oxidation state and redox reactions, balancing of redox reaction equations using "Atomic Oxygen Method" and "Mathematical Methods", consideration of convenience and advantages.

KEYWORDS: The electro balance method, the semi-ion method, the atomic oxygen method, the mathematician method, technology, method, pedagogy technology, and information technology are all examples of methods.

Since it is impossible to imagine life without chemistry, to understand the nature of the changes taking place around us, it is necessary to know substances and the laws of their chemical changes.

If there is some change in the oxidation state of the reactants and products, we can say that electron transfer has occurred. Chemists use oxidation states to observe how electrons are distributed in atoms or molecules. Before learning how to find oxidation states, you need to understand redox reactions.

Redox reactions are everywhere! Your body uses redox reactions to convert food and oxygen into energy and water and CO_2. Then we expel them by exhaling. The batteries in your electronics also rely on redox reactions, which you'll learn more about when we study electrochemistry. Can you find examples of other redox reactions happening around you?

We can guess the first part of this question based on the title of this article. Yes, it's probably a redox reaction, but how can you be sure? We need to show that electron transfer has occurred, and we can determine this by looking at changes in oxidation states as products are formed from reactants.

General types of oxidation-reduction reactions

Because of redox reactions are the main classes of reactions, we want to know them better. There are several basic types of redox reactions that you may want to familiarize yourself with. In each of these examples, take a minute to figure out what is being reduced and what is being oxidized!

1. Combustion reactions

The combustion reaction is an oxidation-reduction reaction between a flammable substance and molecular oxygen (O_2) with the formation of oxygen-containing products. When one of the reactants is a hydrocarbon, the products are carbon dioxide and water.

Below is the combustion reaction of octane, one of the hydrocarbons. Octane is the main

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component of gasoline, and this combustion reaction occurs in most automobile engines:

$$2C_8H_{18} + 25O_2 \rightarrow 16CO_2 + 18H_2O$$

2. Disproportion reactions

A disproportion reaction (or *autoxidation* reaction) in which one reagent is both oxidized and reduced is a reaction. The following reaction disproportionation of hypochlorite (ClO^-). reaction given:

$3ClO^-(aq) \rightarrow ClO_3^-(aq) + 2Cl^-(aq)$

3. Substitution reactions

A substitution reaction (or single replacement reaction) takes place between a simple substance that replaces an element in a compound and a compound that replaces an element in it. For example, many metals react with acids to form salts and hydrogen gas. The following is an example of the reaction that occurs when zinc metal reacts with an aqueous solution of hydrochloric acid to remove hydrogen from the acid:

$Zn(aq) + 2HCl(aq) \rightarrow ZnCl_2(aq) + H_2(g)$

Question.

$\mathbf{Hg_3N+HNO_3 \rightarrow Hg(NO_3)_2+NO+H_2O}$

The balancing of redox reactions.

Method 1:

Balancing redox reaction in terms of oxygen method. .

When balancing oxidation-reduction reactions using the atomic oxygen method, we separate the reaction equation into two reactions. For example:

$\mathbf{Hg_3N+HNO_3 \rightarrow Hg(NO_3)_2+NO+H_2O}$

$\mathbf{HNO_3 \rightarrow NO+H_2O}$

This is what happens and we balance these reactions (except for oxygen). In this process, we do not need an oxidation state. After balancing, we determine the difference between the oxygen on the right and left side of the reaction.

$\mathbf{Hg_3N+6HNO_3 \rightarrow 3Hg(NO_3)_2+NO+3H_2O}$

18 <O> 22 4 differences

$\mathbf{2HNO_3 \rightarrow 2NO+H_2O}$

6 <O> 3 3 differences

We multiply the coefficients of reaction 1 by 3, the reason oxidizer.

2nd reaction we multiply the coefficients by 3, the reason reducer.

$\mathbf{Hg_3N+6HNO_3 \rightarrow 3Hg(NO_3)_2+NO+3H_2O}$ /*3

$\mathbf{2HNO_3 \rightarrow 2NO+H_2O}$ **/*4**

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We can see the transition to state below.

$3Hg_3N+18HNO_3 \rightarrow 3Hg(NO_3)_2+3NO+9H_2O$

$8HNO_3 \rightarrow 8NO+4H_2O$

It comes to the above situation and we summarize these reactions and write them.

$3Hg_3N+26HNO_3 \rightarrow 9Hg(NO_3)_2+11NO+13H_2O$

And finally, both sides of our reaction are equal.

Method 2 We will balance our reaction according to the mathematical method.

In this method, we first write down the reaction and label the upper part of each substance with Latin letters.

a b c d e

$Hg_3N+HNO_3 \rightarrow Hg(NO_3)_2+NO+H_2O$

In this case Hg_3N – a, HNO_3 –b, $Hg(NO_3)_2$ – c, NO – d, H_2O – e each one element mathematician in terms of equalizing we go out. For example:

3a=c

a+ b =2c+d

b=2e

3b=6c+d+e

We can adapt all the following expressions to the letter a. For example:

If C=3a is equal to a+b=6a+d then d=b-5a

If b=2e is equal to 6e=6c+d+e then d=5e-6c.

Let's equate the d-letters so that b-5a=5e-18a, and here we use the expression b=2e again.

2e-5a=5e-18a in this case, e=13/3a appears. We find b using the expression e: b=2e, when e=13/3a, b=26/3a. All expressions are found: b=26/3a, c=3a, d=11/3a, e=13/3a, to save the following expressions from irrationality, we take a=3.

Finally, a = 3, b = 26, c = 9, d = 11, e = 13, and the following reaction equation appears.

$3Hg_3N+26HNO_3 \rightarrow 9Hg(NO_3)_2+11NO+13H_2O$

As can be seen from the above, we can balance the reaction equations without knowing the oxidation state.

“Pinboard “method

In this method, the name of the elements is given in the 1st column, the chemical formula of the elements in the 2nd column and the oxidation level should be written in the 3rd column. Can be used in any topic.

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Elements _ names	Elements _ chemical formula	of the elements oxidation level
Sodium		
Calcium		
Phosphorus		
Nitrogen		
Aluminum		
Chlorine		
Marganese		

- **" Elements tree "**

The advantage of this method is that students can memorize chemical formulas and the names of substances. In the tree made, apples are numbered on one side, and chemical formulas are written on the back, students from 4 groups choose a number in turn, and the student who quickly and correctly says the oxidation state of the substance is encouraged. In this method, students are introduced to the method related to the topic "Elements' oxidation state."

Summary

We can determine the oxidation-reduction reaction by checking the oxidation state. We can divide oxidation-reduction reactions into oxidation and reduction half-reactions. We can use the half-reaction method to balance redox reactions that require mass and charge equality. But these methods are considered very outdated and have a number of disadvantages. For this reason, I suggest methods that do not use this oxidation state, because some reactions are very complicated, and we may encounter a number of difficulties in electrobalance methods. The three general types of redox reactions are combustion, disproportionation, and substitution reactions.

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Lots of light and heat released = chemical reaction! This is a thermite reaction, which is a simultaneous oxidation-reduction reaction. The reaction is as follows:

$Fe_2O_3+2Al \rightarrow 2Fe+Al_2O_3$

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