PREVENTION OF POTENTIAL METAL DEPOSITION IN INDUSTRIAL EQUIPMENT

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Solids can melt or disintegrate when exposed to liquids. in order to correctly imagine the process of melting of objects, we will consider them as an example of the effect of a common solvent - water. the oxygen and hydrogen atoms that make up water form polarized (positive and negative) molecules. polarization determines the strength of the electric field of a water molecule. when a solid body interacts with water, its surface (external) atoms are affected by the electric field of the water molecule. the small size of the water molecule allows it to penetrate into the crystal lattice of a solid body. water molecules entering the crystal lattices show their effects. these effects are considered hydration. in the process of hydration, a breakdown (decomposition) occurs in metal atoms that are weakly bonded to their outer electron. As a result, metal atoms weakly bound with their outer (valence) electrons leave the crystal lattice and move to water. Thus, a positively charged ion-atom is formed. Electrons remaining on the metal surface are negative charge carriers. An electric double layer is formed on the metal surface, representing the potential difference between the metal surface and the solution layer. (See Figure 1).

When the potential difference reaches a certain value, the transfer of ionic atoms to the liquid stops and equilibrium is established. The indicator of the potential at this time is called the equilibrium potential of the metal or the equilibrium potential of the metal electrode.

The indicator of the equilibrium potential depends on the type of metals and the number of half-free electrons in the nodes of their crystal lattice.

If a metal is immersed in a solution of its salt, as a rule, the free energy of the metal ions in the metal is different from that in the solution. If the free energy of the metal ions is greater than that in the solution, for example, when zinc is in a $ZnSO_4$ solution, the metal ions move into the solution and form a positive coating of the electric double layer.

If the free energy of the ions in the solution is greater than that of the metal, for example, in the interaction of copper with a solution of $CuSO_4$, the metal ions leave the solution and settle on the surface of the metal and form a positive coating of the electric double layer

a) b)

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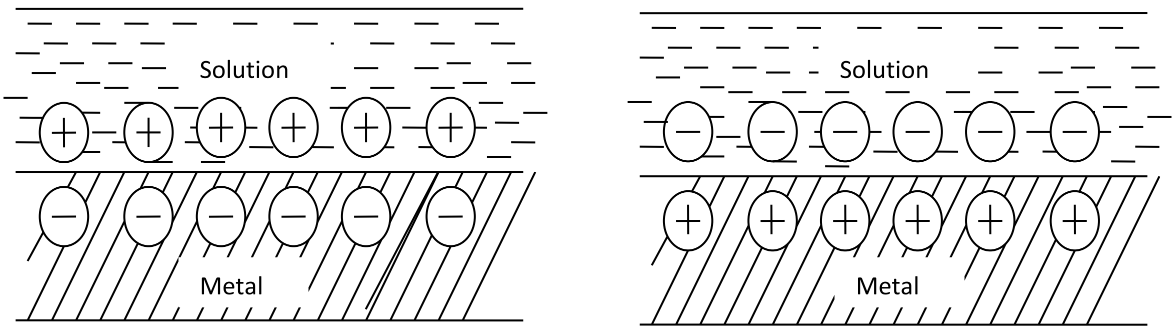

Figure 1. Drawings of the formation of an electric layer on a metal surface:

a) Zn/Zn^{2+} ; b) Cu/Cu^{2+}

Accordingly, SO_4 ions remain in the solution layer in contact with the metal and form a negative coating of the electric double layer.

The release of metal ions from the solution and settling on the metal surface continues until the free energy of the metal ions in the solution becomes equal to that of the metal.

Thus, the electrode (metal) potential in equilibrium depends on the properties of ions and their concentration. V. that the electrode potential depends on the concentration of potential-determining ions in the electrolyte solution. Nerst expresses as follows

$$\varphi = \varphi_0 + \frac{RT}{ZF} tgC$$

where - universal gas constant;

T-temperature; ¬ Faraday number.

At concentration S, 1 mol of its ions in 1 L of solution, the electrode potential is equal to the normal equilibrium potential. It can be determined thermodynamically.

One of the technological measures to protect the equipment of the oil and gas industry from metal potential is to reduce the pressure of the gas environment and create a free circulation of the fluid in the space between the pipes. This event is carried out by installing parker devices and filling the bush above them with non-aggressive oil. Buffer liquids are also used to increase the reliability of Absad columns. In this case, the outer surface space of the pipe above the cement stone is filled with a buffer solution. Reagents that reduce the activity of SKB and bind oxygen are added to the buffer solutions. A highly alkaline soil solution is used as a buffer liquid.

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