

THE PRODUCTION TECHNOLOGY OF FERRATE SOLUTIONS FOR ABSORPTION OF CARBON(II) OXIDE

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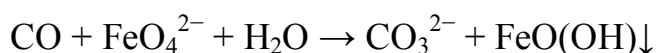
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The fundamental possibility of the absorption of carbon(II) oxide by aqueous ferrates(VI) solutions was predicted earlier in [1]. However, the optimal conditions and patterns of this process were not established then. This work is devoted to the development of the production technology of alkaline solutions of sodium ferrate(VI) (Na₂FeO₄), which are proposed to be used to extract CO from the gaseous phase.

It was experimentally established that the chemisorption of carbon(II) oxide in the ferrate solutions proceeds with a noticeable rate only in the presence of certain substances, in particular Mn(VI), Cr(VI), Sn(IV), Cu(II), Ag(I), Co(III) and other compounds. It is important to note that the best effect is achieved with the combined action of both homogeneous (MnO₄²⁻, CrO₄²⁻, [Cu(OH)₄]²⁻, [Sn(OH)₆]²⁻) and heterogeneous (SnO₂, Ag₂O, CoO(OH), HgO) catalysts.

Schematically, the absorption of CO can be represented in the form of the following chemical reaction:



The alkaline solutions containing 0.01–0.1 M Na₂FeO₄ have been proposed to be obtained chemically in the temperature range 280–285 K by oxidizing sodium hypochlorite with a salt composition, such as (Fe(II) or Fe(III) compounds with the addition of Sn(IV), Mn(II), Cr(III), Ag(I), Cu(II) etc.) in the presence of the excess of sodium hydroxide (13–14 M OH⁻). An excess of sodium hydroxide is necessary to suppress the hydrolysis of Fe(VI) salts, as well as to increase the degree of the chemisorption of CO, which as shown increases with increasing concentration of OH⁻ ions. It was found that the optimal content of homogeneous catalysts in the solution should be ~ 0.01 M, and heterogeneous should not exceed 5% of Fe(VI). Otherwise, accelerated decomposition of FeO₄²⁻ will occur. However, this process does not reduce the efficiency of the main reaction.

It should be noted that due to described reaction in the absorption solution a monotonic decrease in the concentration of FeO₄²⁻ and an increase in the content of CO₃²⁻ anions occurs. This inevitably leads to the formation of precipitation of iron oxyhydroxide and sodium carbonate. Therefore, periodic adjustment of the solution is required to compensate for the loss of Fe(VI) and remove precipitates.

References

1. Golovko D.A., Goncharova I.V., Golovko I.D., Belyanovskaya E.A., Danilov F.I. Absorption of NO and CO by the alkaline solutions of sodium ferrate // ACS National Meeting Book of Abstracts. 2006. – 232. – P. 716.