SULFUR DIOXIDE OXIDATION BY OXYGEN AT THE PRESENCE OF NANOSTRUCTURED CATALYSTS

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Sulfur dioxide is thrown out in air in quantity 150 million tons annually and renders harmful influence on a human organism. We for the first time have shown that complex compounds of cobalt, nickel, manganese, iron, copper, fixed on a polymeric matrix are active in reaction of sulfur dioxide oxidation by oxygen.

Kinetic of SO_2 oxidation by oxygen is investigated in details for a lot of polymeric matrixes of an artificial origin: polyethyleneimine, polyacrylic acid, polyacrylamide, styromale – a copolymer of styrene and maleinic anhydride and also natural polymers – humic acids separated from Kazakhstan coals. The received kinetic results are described by the equation:

$$W_{O_2} = \frac{k_j \cdot \sum_{j=1}^{2} C^j_{Co^{2+}} \cdot \alpha_j \cdot \sum_{j=1}^{2} C^j_{SO_2} \cdot \beta_j \cdot C_P \cdot \gamma}{\sum_{j=0}^{2} C^j_{Co^{2+}} \cdot \alpha_j \cdot \sum_{j=0}^{2} C^j_{SO_2} \cdot \beta_j \cdot \sum_{j=0}^{2} C^j_P \cdot \gamma},$$

where P – polymer, α_j – constant of binuclear complexes of cobalt formation, β_j – constant of cobalt complexes with SO_2 formation, γ – a constant of cobalt complexes with polymeric matrix formation.

Kinetic and thermodynamic parameters for the investigated polymers at 303K are summarized below:

Table 1.

Polymeric matrix	k_j, s^{-1}	α_j, l/mole	β_j, l/mole	γ
Polyacrylamide (PAAm)	2,08	$2{,}2 \cdot 10^2$	1,67	0,28
Polyacrylic acid (PAAc)	$6 \cdot 10^{-1}$	$7{,}4 \cdot 10^2$	0,94 1,88	0,355
Styromale (StM)	$4 \cdot 10^{-1}$	$3{,}8 \cdot 10^2$	0,9 5,5	0,71

On influence on cobalt complexes catalytic activity polymers settle down in a raw: PAAm > PAAc > StM. The mechanism of polymer influence on fixed complexes activity is discussed.

Catalytic solution allowing to clear $4 \cdot 10^3$ mole of Na_2SO_3 on mole of catalyst without loss of activity is developed on the basis of the cobalt complexes fixed on polyethyleneimine. The received catalysts possess high catalytic activity (>10000 $hour^{-1}$). The offered catalyst has passed laboratory test on vorticose plant by productivity 2 m^3/hour (on gas), and also is tested on Thermal Power Station-2 in Almaty in the process of clearing smoke gases of compounds of sulfur on plant by productivity 180$м^3$/hour. SO_2 containing was decreased on 90-92 %, NO_x containing was decreased on 80-83 %, C containing was decreased on 80-82 % and departing gases was leaded to sanitary norms.