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ABOUT THE DEPOSITION OF BORON FROM THE GAS PHASE

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Thermal decomposition of hydride boron is a difficult multistage process and in simplified can be presented by the following equations:

$$B_2H_6 \Rightarrow 2BH_3 \;; \qquad (1)$$

$$aBH_3 + bB_2H_6 \Rightarrow B_xH_y + zH_2 \;; \qquad (2)$$

$$B_xH_y \Rightarrow xB + 0{,}5y\,H_2 \;. \qquad (3)$$

Proceeding from the suggested mechanism, the process rate can be limited by either dissociation of B_2H_6 or decomposition of intermediate reaction products on the substrate deposition.

Dissociation of rate B_2H_6 (V_{dis}) in depending on process temperature and initial component concentration is determined by equation:

$$V_{dis} = A \cdot \exp\left(-\frac{E \cdot a}{R \cdot T}\right) \cdot \left[\tilde{N}_{B_2H_6}\right] \;, \qquad (4)$$

where A, E – before-exponent and energy of activation for dissociation process; $\left[\tilde{N}_{B_2H_6}\right]$ – a concentration of B_2H_6.

In the reactor of decomposition of flow-type a reaction is implemeted:

$$B_2H_6 \Rightarrow 2B + 3H_2 \;. \qquad (5)$$

For a reaction (2) in absence of heterogeneous processes the model of running reactor of cylindrical type will be characterized by the system of equations:

$$\frac{d}{dz}\left(U \cdot C_{B_2H_6}\right) + \frac{2R_{int} \cdot \xi \cdot \beta \cdot k^r \cdot C_{B_2H_6}}{\left(R_{ext}^2 - R_{int}^2\right) \cdot \left(\xi \cdot k^r + \beta\right)} = 0 \;; \qquad (6)$$

$$\frac{d}{dz}\left(U \cdot C_{H_2}\right) + \frac{2R_{int} \cdot \xi \cdot \beta \cdot k^r \cdot C_{H_2}}{\left(R_{ext}^2 - R_{int}^2\right) \cdot \left(\xi \cdot k^r + \beta\right)} = 0 \;, \qquad (7)$$

where U – rate of gas stream along the axis of reactor; z – a co-ordinate, directed along the axis of reactor; R_{ext}, R_{int} – an outward and internal radius of reactor; ξ, β, k^r – constants, determined by the experienced way.

A model, presented by the system of equations (6)-(7), allows to calculate kinetic descriptions of deposition process of the boron on the heated surfaces.

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