Система уравнений:

$$-\frac{\partial p_1}{\partial t} - a\left(\frac{\partial^2 p_1}{\partial x^2} + \frac{\partial^2 p_1}{\partial y^2} + \frac{\partial^2 p_1}{\partial z^2}\right) + 4\kappa_a\theta^3(bp_1 - p_2) = \theta - \theta_d,$$

$$-\alpha\left(\frac{\partial^2 p_2}{\partial x^2} + \frac{\partial^2 p_2}{\partial y^2} + \frac{\partial^2 p_2}{\partial z^2}\right) + \kappa_a(p_2 - bp_1) = 0,$$

$$\Omega = \{(x, y)\colon 0 < x < L,\ 0 < y < L,\ 0 < z < L\},$$

$$-a\frac{\partial p_1}{\partial x} + \beta p_1\Big|_{x=0} = 0, \quad a\frac{\partial \theta}{\partial x} + \beta p_1\Big|_{x=L} = 0,$$

$$-a\frac{\partial p_1}{\partial y} + \beta p_1\Big|_{y=0} = 0, \quad a\frac{\partial p_1}{\partial y} + \beta p_1\Big|_{y=L} = 0,$$

$$-a\frac{\partial p_1}{\partial z} + \beta p_1\Big|_{z=0} = 0, \quad a\frac{\partial p_1}{\partial z} + \beta p_1\Big|_{z=L} = 0,$$

$$-\alpha\frac{\partial p_2}{\partial x} + up_2\Big|_{x=0} = 0, \quad \alpha\frac{\partial p_2}{\partial x} + up_2\Big|_{x=L} = 0,$$

$$-\alpha\frac{\partial p_2}{\partial y} + up_2\Big|_{y=0} = 0, \quad \alpha\frac{\partial p_2}{\partial y} + up_2\Big|_{y=L} = 0,$$

$$-\alpha\frac{\partial p_2}{\partial z} + up_2\Big|_{z=0} = 0, \quad \alpha\frac{\partial p_2}{\partial z} + up_2\Big|_{z=L} = 0,$$

$$p_1|_{t=T} = 0.$$

Введем сетку

$$\overline{\omega} = \{(x_i, y_j, z_k, t_m)\colon x_i = ih, y_j = jh, z_k = kh, t_m = m\tau, i = \overline{0, N}, j = \overline{0, N}, k = \overline{0, N}, m = \overline{0, M}\},$$

$$h = L/N, \ \ \tau = T/M.$$

$0 < i < N$, $0 < j < N$, $0 < k < N$:

$$\frac{p^m_{1;i,j,k} - p^{m+1}_{1;i,j,k}}{\tau} + \frac{1}{2}\Big[-\frac{a}{h^2}(p^{m+1}_{1;i-1,j,k} - 2p^{m+1}_{1;i,j,k} + p^m_{1;i+1,j,k}) - \frac{a}{h^2}(p^m_{1;i,j-1,k} - 2p^m_{1;i,j,k} + p^m_{1;i,j+1,k}) -$$

$$-\frac{a}{h^2}(p^m_{1;i,j,k-1} - 2p^m_{1;i,j,k} + p^m_{1;i,j,k+1}) + 4\kappa_a(\theta^m_{i,j,k})^3(bp^m_{1;i,j,k} - p^m_{2;i,j,k})\Big] +$$

$$+\frac{1}{2}\Big[-\frac{a}{h^2}(p^{m+1}_{1;i-1,j,k} - 2p^{m+1}_{1;i,j,k} + p^{m+1}_{1;i+1,j,k}) - \frac{a}{h^2}(p^{m+1}_{1;i,j-1,k} - 2p^{m+1}_{1;i,j,k} + p^{m+1}_{1;i,j+1,k}) -$$

$$-\frac{a}{h^2}(p^{m+1}_{1;i,j,k-1} - 2p^{m+1}_{1;i,j,k} + p^{m+1}_{1;i,j,k+1}) + 4\kappa_a(\theta^{m+1}_{i,j,k})^3(bp^{m+1}_{1;i,j,k} - p^{m+1}_{2;i,j,k})\Big] = \frac{1}{2}(\theta^m_{i,j,k} - \theta_d) + \frac{1}{2}(\theta^{m+1}_{i,j,k} - \theta_d),$$

$$-\frac{\alpha}{h^2}(p^m_{2;i-1,j,k} - 2p^m_{2;i,j,k} + p^m_{2;i+1,j,k}) - \frac{\alpha}{h^2}(p^m_{2;i,j-1,k} - 2p^m_{i,j,k} + p^m_{2;i,j+1,k}) -$$

$$-\frac{\alpha}{h^2}(p^m_{2;i,j,k-1} - 2p^m_{2;i,j,k} + p^m_{2;i,j,k+1}) + \kappa_a(p^m_{2;i,j,k} - bp^m_{1;i,j,k}) = 0.$$

$i = 0,\ 0 < j < N,\ 0 < k < N$:

$$\frac{1}{2}\left[-\frac{a}{h}(p^m_{1;1,j,k} - p^m_{1;0,j,k}) + \beta p^m_{1;0,j,k} - \frac{a}{2h}(p^m_{1;0,j-1,k} - 2p^m_{1;0,j,k} + p^{m+1}_{1;0,j+1,k}) -\right.$$

$$\left. -\frac{a}{2h}(p^m_{1;0,j,k-1} - 2p^m_{1;0,j,k} + p^m_{1;0,j,k+1}) + \frac{4\kappa_a h}{2}(\theta^m_{0,j,k})^3(bp^m_{1;0,j,k} - p^m_{2;0,j,k})\right] +$$

$$+\frac{1}{2}\left[-\frac{a}{h}(p^{m+1}_{1;1,j,k} - p^{m+1}_{1;0,j,k}) + \beta p^{m+1}_{1;0,j,k} - \frac{a}{2h}(p^{m+1}_{1;0,j-1,k} - 2p^{m+1}_{1;0,j,k} + p^{m+1}_{1;0,j+1,k}) -\right.$$

$$\left. -\frac{a}{2h}(p^{m+1}_{1;0,j,k-1} - 2p^{m+1}_{1;0,j,k} + p^{m+1}_{1;0,j,k+1}) + \frac{4\kappa_a h}{2}(\theta^{m+1}_{0,j,k})^3(bp^{m+1}_{1;0,j,k} - p^{m+1}_{2;0,j,k})\right] + \frac{h}{2\tau}(p^m_{1;0,j,k} - p^{m+1}_{1;0,j,k}) =$$

$$= \frac{1}{2}\left[\frac{h}{2}(\theta^m_{0,j,k} - \theta_d)\right] + \frac{1}{2}\left[\frac{h}{2}(\theta^{m+1}_{0,j,k} - \theta_d)\right],$$

$$-\frac{\alpha}{h}(p^m_{2;1,j,k} - p^m_{2;0,j,k}) + u_{0,j,k}p^m_{2;0,j,k} - \frac{\alpha}{2h}(p^m_{2;0,j-1,k} - 2p^m_{2;0,j,k} + p^m_{2;0,j+1,k}) -$$

$$-\frac{\alpha}{2h}(p^m_{2;0,j,k-1} - 2p^m_{2;0,j,k} + p^m_{2;0,j,k+1}) + \frac{\kappa_a h}{2}(p^m_{2;0,j,k} - bp^m_{1;0,j,k}) = 0.$$

$i = 0,\ j = 0,\ 0 < k < N$:

$$\frac{1}{2}\left[-\frac{a}{h}(p^m_{1;1,0,k} - p^m_{1;0,0,k}) + \beta p^m_{1;0,0,k} - \frac{a}{h}(p^m_{1;0,1,k} - p^m_{1;0,0,k}) + \beta p^m_{1;0,0,k} -\right.$$

$$\left. -\frac{a}{2h}(p^m_{1;0,0,k-1} - 2p^m_{1;0,0,k} + p^m_{1;0,0,k+1}) + \frac{4\kappa_a h}{2}(\theta^m_{0,0,k})^3(bp^m_{1;0,0,k} - p^m_{2;0,0,k})\right] +$$

$$+\frac{1}{2}\left[-\frac{a}{h}(p^{m+1}_{1;1,0,k} - p^{m+1}_{1;0,0,k}) + \beta p^{m+1}_{1;0,0,k} - \frac{a}{h}(p^{m+1}_{1;0,1,k} - p^{m+1}_{1;0,0,k}) + \beta p^{m+1}_{1;0,0,k} -\right.$$

$$\left. -\frac{a}{2h}(p^{m+1}_{1;0,0,k-1} - 2p^{m+1}_{1;0,0,k} + p^{m+1}_{0,0,k+1}) + \frac{4\kappa_a h}{2}(\theta^{m+1}_{0,0,k})^3(bp^{m+1}_{1;0,0,k} - p^{m+1}_{2;0,0,k})\right] + \frac{h}{2\tau}(p^m_{1;0,0,k} - p^{m+1}_{1;0,0,k}) =$$

$$= \frac{1}{2}\left[\frac{h}{2}(\theta^m_{0,0,k} - \theta_d)\right] + \frac{1}{2}\left[\frac{h}{2}(\theta^{m+1}_{0,0,k} - \theta_d)\right],$$

$$-\frac{\alpha}{h}(p^m_{2;1,0,k} - p^m_{2;0,0,k}) + u_{0,0,k}p^m_{2;0,0,k} - \frac{\alpha}{h}(p^m_{2;0,1,k} - p^m_{2;0,0,k}) + u_{0,0,k}p^m_{2;0,0,k} -$$

$$-\frac{\alpha}{2h}(p^m_{2;0,0,k-1} - 2p^m_{2;0,0,k} + p^m_{2;0,0,k+1}) + \frac{\kappa_a h}{2}(p^m_{2;0,0,k} - bp^m_{1;0,0,k}) = 0.$$

$i = 0$, $j = 0$, $k = 0$:

$$\frac{1}{2}\left[-\frac{a}{h}(p^m_{1;1,0,0} - p^m_{1;0,0,0}) + \beta p^m_{1;0,0,0} - \frac{a}{h}(p^m_{1;0,1,0} - p^m_{1;0,0,0}) + \beta p^m_{1;0,0,0} - \right.$$

$$\left. - \frac{a}{h}(p^m_{1;0,0,1} - p^m_{1;0,0,0}) + \beta p^m_{1;0,0,0} + \frac{4\kappa_a h}{2}(\theta^m_{0,0,0})^3(b p^m_{1;0,0,0} - p^m_{2;0,0,0})\right] +$$

$$+\frac{1}{2}\left[-\frac{a}{h}(p^{m+1}_{1;1,0,0} - p^{m+1}_{1;0,0,0}) + \beta p^{m+1}_{1;0,0,0} - \frac{a}{h}(p^{m+1}_{1;0,1,0} - p^{m+1}_{1;0,0,0}) + \beta p^{m+1}_{1;0,0,0} - \right.$$

$$\left. - \frac{a}{h}(p^{m+1}_{1;0,0,1} - p^{m+1}_{1;0,0,0}) + \beta p^{m+1}_{1;0,0,0} + \frac{4\kappa_a h}{2}(\theta^{m+1}_{0,0,0})^3(b p^{m+1}_{1;0,0,0} - p^{m+1}_{2;0,0,0})\right] + \frac{h}{2\tau}(p^m_{1;0,0,0} - p^{m+1}_{1;0,0,0}) =$$

$$= \frac{1}{2}\left[\frac{h}{2}(\theta^m_{0,0,0} - \theta_d)\right] + \frac{1}{2}\left[\frac{h}{2}(\theta^{m+1}_{0,0,0} - \theta_d)\right],$$

$$-\frac{\alpha}{h}(p^m_{2;1,0,0} - p^m_{2;0,0,0}) + u_{0,0,0}p^m_{2;0,0,0} - \frac{\alpha}{h}(p^m_{2;0,1,0} - p^m_{2;0,0,0}) + u_{0,0,0}p^m_{2;0,0,0} -$$

$$- \frac{\alpha}{h}(p^m_{2;0,0,1} - p^m_{2;0,0,0}) + u_{0,0,0}p^m_{2;0,0,0} + \frac{\kappa_a h}{2}(p^m_{2;0,0,0} - b p^m_{1;0,0,0}) = 0.$$

Для остальных случаев схема записывается симметрично.