[1] [2]

[1]

[2]

,

-495-132- -495-132-5870

e-mail: rmtcom@dol.ru http://www.rmtltd.ru

-

-

$T(x)$

q $\pm\kappa(T)\frac{dT(x)}{dx}+\alpha(T)jT(x)$ $\kappa(T)$ -

$\alpha(T)$ - j - $\frac{dT(x)}{dx}$

x

q

Q_0

Q

$j > 0$

$\alpha \geq 0$

,

$$\frac{dT}{dx} = \frac{j}{\kappa} q - \frac{j\alpha T}{\kappa}, \qquad \qquad (1)$$

$$\frac{dq}{dx} = -\frac{j}{\sigma} + \frac{\alpha j}{\kappa} q - \frac{j\alpha^2}{\kappa} T,$$

σ -

$$q = \frac{\kappa \frac{dT}{dx} + \alpha j T(x)}{j}$$

$q(0) = Q/sj$, $q(1) = Q_0/sj$ s -

T q

Turbo Pascal

.

T_h T_c

j_{opt},

μ:

$$\mu = \frac{Q}{Q_0} = \frac{q(0)}{q(1)}, \qquad \qquad (2)$$

μ_{min}.

T q

ψ_1 ψ_2, H:

$$H=\psi_1\frac{dT}{dx}+\psi_2\frac{dq}{dx},\qquad (3)$$

ψ_1 ψ_2:

$$\frac{d\psi_1}{dx}=-\frac{\partial H}{\partial T},\ \frac{d\psi_2}{dx}=-\frac{\partial H}{\partial q}\qquad (4)$$

$(\cdot)$ x

j_{opt}

$$j_{opt}=\frac{\psi_2\alpha T\big|_0^1}{\int_0^1\left[\left(\frac{\psi_2}{\sigma}(1-ZT)-\frac{q\psi_1}{\kappa}\right)+\frac{\psi_2 T}{\kappa}\frac{d\alpha}{dT}(q\ \ldots\right]}\qquad (5)$$

$$Z(x)=\frac{\alpha(T(x))^2\sigma(T(x))}{\kappa(T(x))}$$ -

[4].

T

q ,

ψ_1 ψ_2

,

-

j_{opt} -

$$\alpha_c T_c j - \frac{1}{2} j^2 \rho_c - \kappa_{eff} \Delta T = q(1),$$
$$\alpha_h T_h j + \frac{1}{2} j^2 R_h - \kappa_{eff} \Delta T = q(0), \qquad (6)$$

$\Delta T = T_h - T_c$ $\alpha_h, \alpha_c, \rho_h, \rho_c$

$$\kappa_{eff} = \bar{\kappa} = \frac{1}{\int_0^1 \frac{dx}{\kappa(T_x)}} \qquad (7)$$

$$\alpha_c = \alpha(T_c) + \frac{\bar{\kappa}}{T_c} \int_0^1 T_y \frac{d\alpha(T_y)}{dT} \frac{dT}{dy} dy \int_y^1 \frac{dx}{\kappa(T_x)}$$

$$\alpha_h = \alpha(T_h) - \frac{\bar{\kappa}}{T_h} \int_0^1 T_y \frac{d\alpha(T_y)}{dT} \frac{dT}{dy} dy \int_0^y \frac{dx}{\kappa(T_x)} \qquad (9)$$

$$\rho_c = 2\bar{\kappa} \int_0^1 \rho(T_y) dy \int_y^1 \frac{dx}{\kappa(T_x)} \qquad (10)$$

$$\rho_h = 2\bar{\kappa} \int_0^1 \rho(T_y \ [illegible] \qquad (11)$$

-

α_c α_h :

$$\alpha_h T_h - \alpha_c T_c = \bar{\alpha} \Delta T = \int_{T_c}^{T_h} \alpha(T) dT \qquad (12)$$

ρ_c ρ_h :

$$\rho_h + \rho_c = 2\bar{\rho} = 2\int_0^1 \rho(T_x) dx \qquad (13)$$

α_c α_h

,

ρ_c ρ_h T_h

T_c :

$$j_{opt} = \frac{\bar{\alpha} \Delta T}{\bar{\rho}(M_{eff} - 1)} \qquad (14)$$

M_{eff} :

$$M_{eff} = \sqrt{1+ZT_{eff}}\ ,\ Z = \frac{\bar{\alpha}^2}{\bar{\rho}\bar{\kappa}} \qquad (15)$$

:

$$\left(\alpha_{cn}+\alpha_{cp}\right)T_c\, j - \frac{1}{2} j^2\left(\rho_{cn}+\rho_{cp}\right) - \left(\kappa_{effn}+\kappa_{effp}\right)\Delta T = q_n(1) \ldots$$

$$\left(\alpha_{hn}+\alpha_{hp}\right)T_h\, j + \frac{1}{2} j^2\left(\rho_{hn}+\rho_{hp}\right) - \left(\kappa_{effn}+\kappa_{effp}\right)\Delta T = q_n(0)+q_p(0), \qquad (17)$$

n,p

$\alpha_{cn}, \alpha_{cp}, \rho_{cn}, \rho_{cp}, \kappa_{effn}, \kappa_{effp}$ -

$\bar{\alpha}$, $\bar{\rho}$, $\bar{\kappa}$

n- p- -

μ_{min}, $q(0)$, $q(1)$

-

j_{opt}

-

-$\left|\alpha^{300}\right|$ $\left|\alpha^{300}\right|$

-

$j_{opt}^{(0)}$

!

$j_{opt}^{(0)}$

$\bar{p}$

$$\bar{p} = \frac{p(T_h) + p(T_c)}{2} \quad (18)$$

$$T_{eff} = \frac{T_h + T_c}{2} \quad (19)$$

.

T_c	T_h ,	$\lvert \alpha_n^{300} \rvert$,	α_p^{300} ,				
				j_{opt} , 2	μ	j_{opt} , 2	μ
250	300	210	210	31,126	4,185	31,263	4,165
220	250	230	230	21,88	3,012	22,516	3,014
250	300	210	230	26,986	4,156	28,698	4,155
220	250	230	250	18,751	3,061	20,366	3,052

μ

!

μ

-

$\mu(j)$

μ

$\alpha_{cn}, \alpha_{cp}, \rho_{cn}, \rho_{cp}, \kappa_{effn}, \kappa_{effp}$

1.
-132
2. Drabkin I., Dashevsky Z. Proc. of fifth European workshop on thermoelectrics, Pardubice, 1999, p. 154.
3. . ., . ., , .- ,2000 , . 292-297.
4.
-