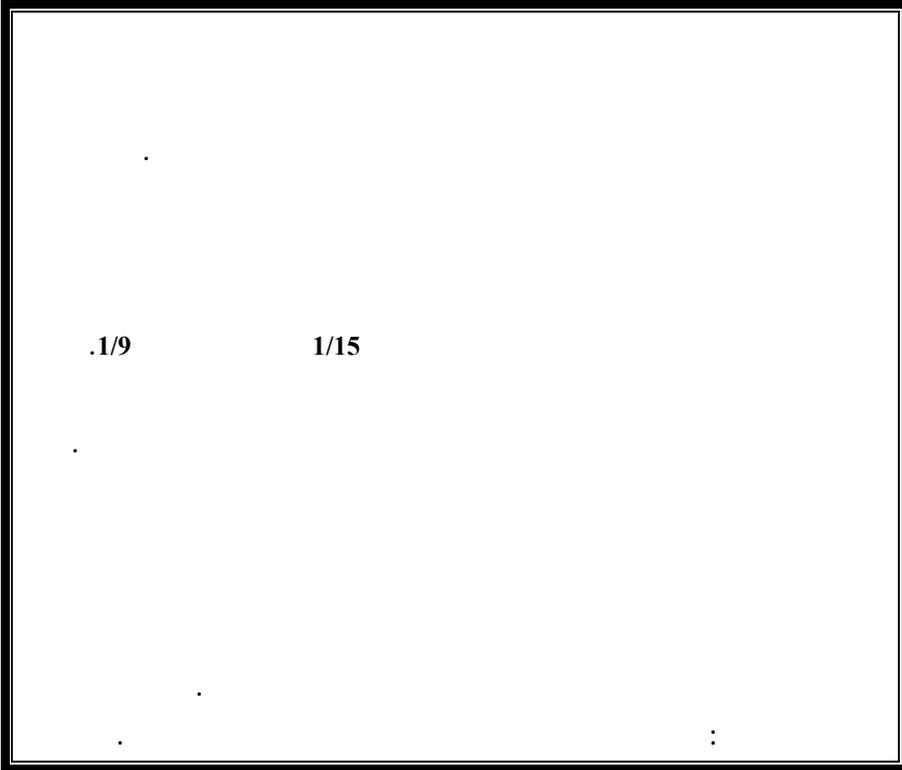


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[17]

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[18:20]

[22:21]

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[24]

[23]

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[27·26]

:

$$pv = RT \quad (1)$$

- T

-R

-v

-p

:

$$m = m_b + m_u = \bar{\rho}_b V_b + \bar{\rho}_u V_u = p_i (V_c - V_e) / RT_i \quad (2)$$

$$.(\quad) \quad - m :$$

$$- m_b$$

$$- m_u$$

$$- V_c$$

$$- V_e$$

u b

i

()

- $\bar{\rho}$

:

$$V_i = V_c - V_e = V_b + V_u \quad (3)$$

:

$$E_i - Q_e - Q_r - Q_w = E_b + E_u \quad (4)$$

E_i :

- Q_e

- Q_r

- Q_w

:

$$Q_e = pV_{eb} / (\gamma_b - 1) = E_{eb} \quad (5)$$

$$Q_w = pV_{wb} / (\gamma_u - 1) = E_{wb} \quad (6)$$

- E_{eb}

- E_{wb}

- γ_b

- γ_u

:

$$Q_r = \int_0^{\dot{Q}_r} \dot{Q}_r(t') dt' = 4\alpha_p V_b \sigma T_b^4 \quad (7)$$

- α_p

[31-29]

-

- σ

$$\int_0^{x_b} (v_{bs}(T', p) - v_{us}) dx' = v_i - v_{us} + (V_{eb} + V_{wb} + V_{ph}) / m \quad (8)$$

$$\int_0^{x_b} (e_{bs}(T', p) - e_{us}) dx' = e_i - e_{us} + (pV_{ph} / (\gamma_u - 1) - Q_r) / m \quad (9)$$

$$v_i = (V_c - V_e) / m \quad e_i = E_i / m :$$

-us

-bs

$$T_b(r, t) \quad x_b(p) \quad p$$

$$p(t)$$

$$x_b(t)$$

$$.T(r, t) \quad t \quad r$$

$$\dot{m}_b = m\dot{x}_b$$

$$x_b(t)$$

.[33-32] كود STANJAN, JANAF

$$p(v_{bs} / (\gamma_b - 1) - v_{us} / (\gamma_u - 1)) = h_{ub} + \frac{p(v_i - v_{us})}{(\gamma_u - 1)} + \left(\frac{pV_{ph}}{(\gamma_u - 1)} - Q_r \right) / m \quad (10)$$

$$h_{ub} = h_{fu} - h_{fb}$$

$$- V_{ph}$$

$$- v_{us}$$

$$(10 \quad 8)$$

$$S_b = \dot{m}_b / \rho_u A_b = m \dot{x} / \rho_u A_b \quad (11)$$

A_b

$$\dot{m}_b = d/dt(\rho_b V_b) = \rho_b A_b \dot{r} + V_b \dot{\rho}_b \quad (12)$$

$-\rho_b$

$$m_b = m - \rho_u V_u = m - (\rho_u / \rho_b) \rho_b (V_c - V_e - V_b) \quad (13)$$

$$\dot{m}_b = (\rho_u / \rho_b) ((V_c - V_e - V_b) \dot{\rho}_b - \rho_b A_b \dot{r}_b) \quad (14)$$

$$A_b = 4\pi r_b^2 - 2\pi r_e^2 \quad (15)$$

$$V_b = (4/3)\pi r_b^3 - 2\pi r_e^2 r_b \quad (16)$$

$$S_f = \dot{r}_b = S_b (\rho_u / \rho_b - y_b (\rho_u / \rho_b - 1)) \quad (17)$$

$$y_b = V_b / (V_c - V_e) \quad S_f$$

$$S_f = (\rho_u / \rho_b) S_b \quad y_b = 0$$

$$S_f = S_b \quad y_b = 1$$

$$u_g = S_f - S_b \quad (18)$$

$$u_g = S_b(\rho_u / \rho_b - 1)(1 - y_b) \quad (19)$$

-6

(3.2.1)

Φ

-

(1-0.65)

Φ

(1-1.5)

Φ

(1 > Φ) Φ

:($\Phi=1$)

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(3)

()

(2)

Φ

(4)

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[15]

[23]

$\Phi=1.1$

/ 0.48

Ti=373K

Φ

(5)

/ 0.73

(7.6)

Φ

(8)

(Ti=373K)

(9)

300K Ti

453 K

(10)

(11)

Φ

$\Phi=1.05$

-

-

.8:9 (11)

(13) 1.2< Φ

($\Phi=1$)

(13:12)

.Ti

: -7

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-

-1

453K

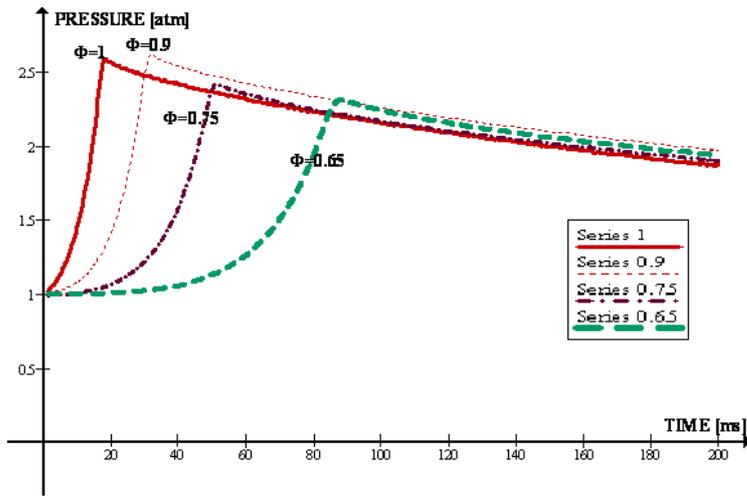
300K

.atm10 1

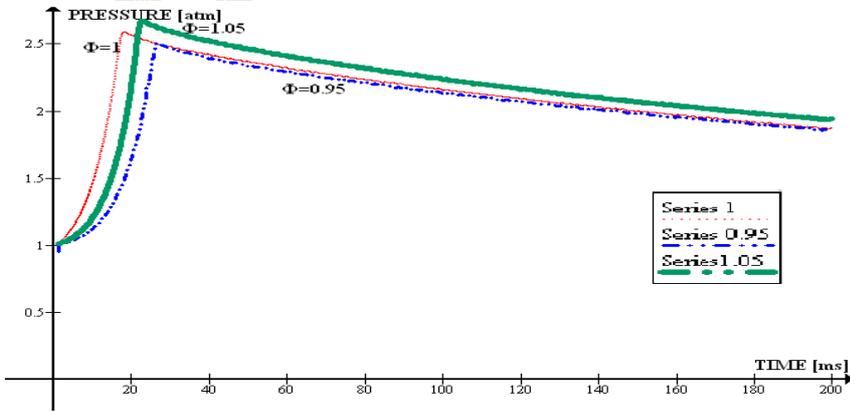
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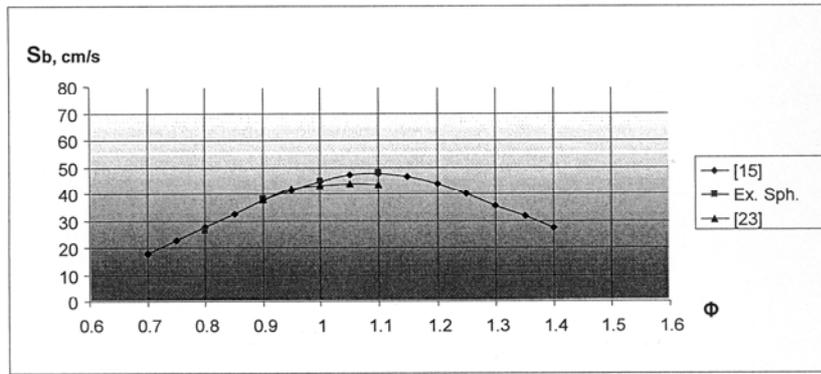
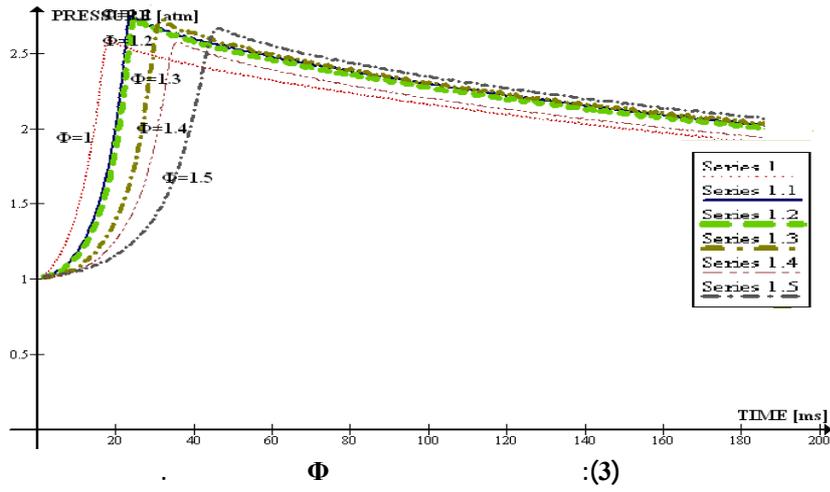
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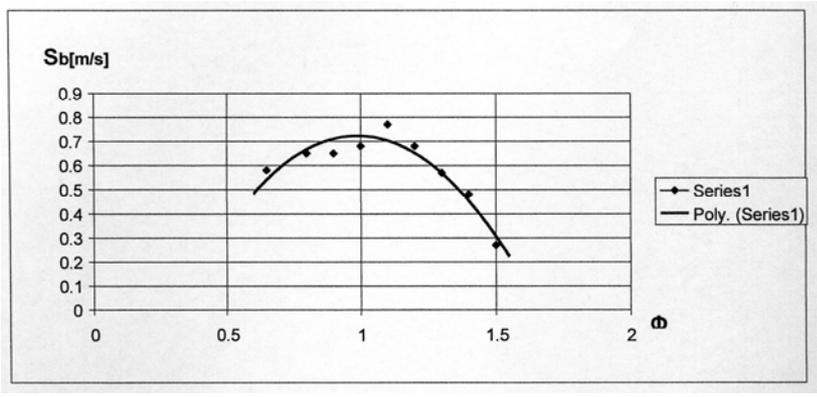
.1 > Φ : (1)



Φ : (2)

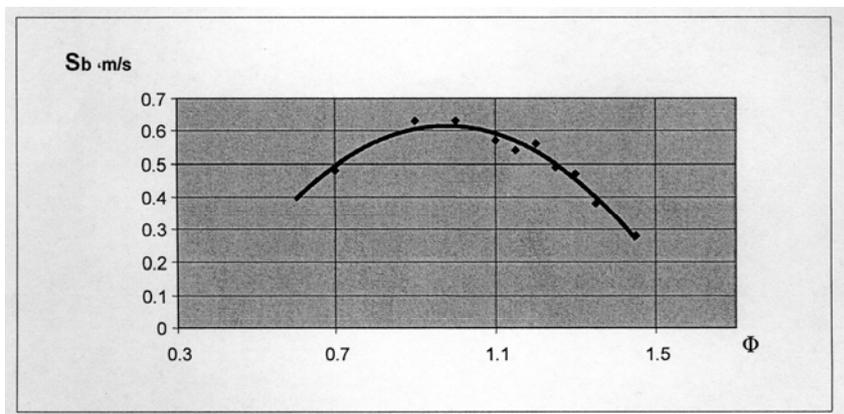


. Ti=298 K Pi=1atm



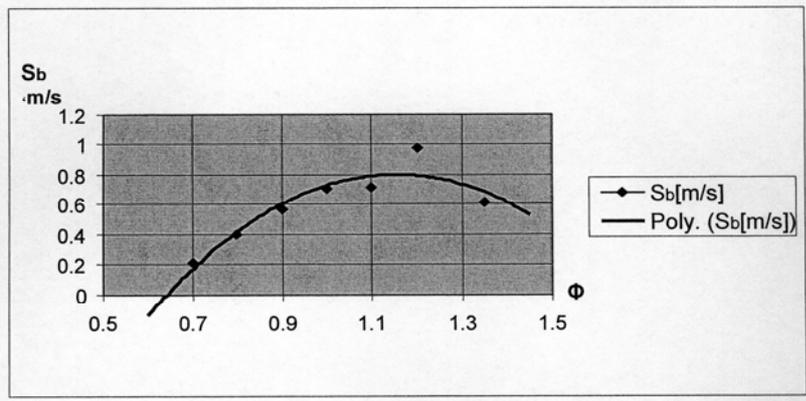
Φ - : (5)

. $T_i=373K$ $P_i=1atm$:

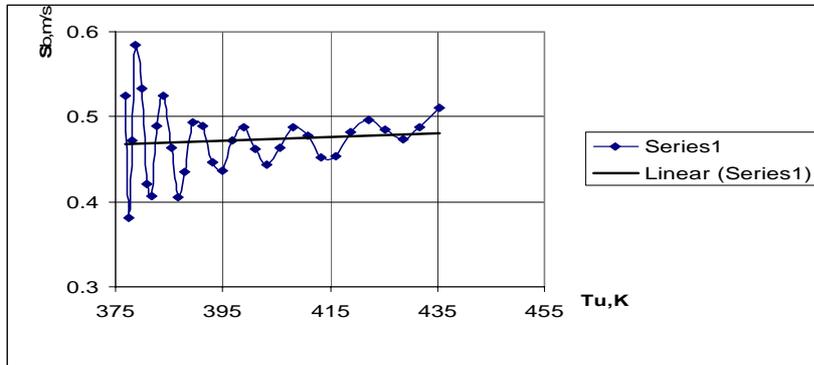


Φ - : (6)

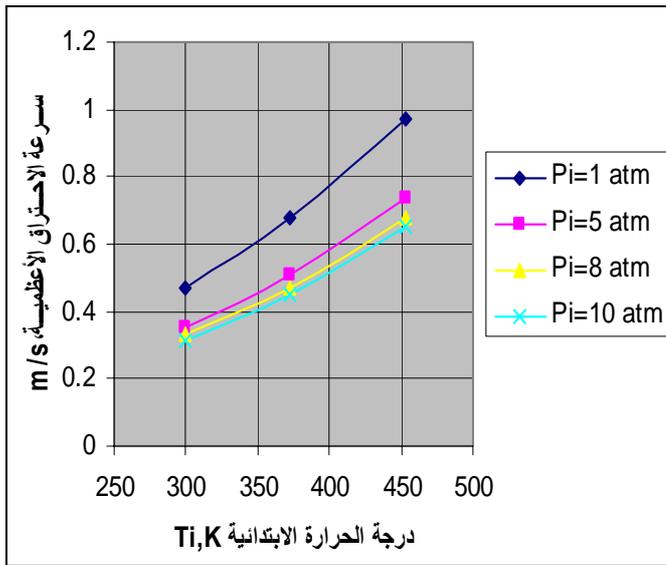
. $P_i=5atm$ $T_i=373K$



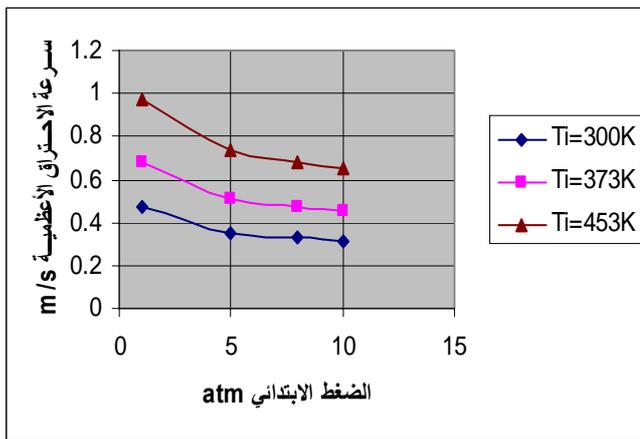
Pi=5 atm Φ - : (7)
 .Ti=453K



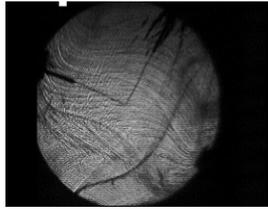
. Ti=373K Pi=5atm $\Phi=1.3$: (8)



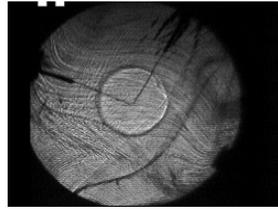
:(9)



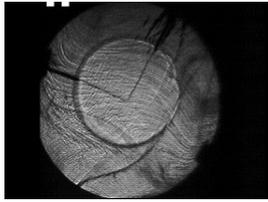
:(10)



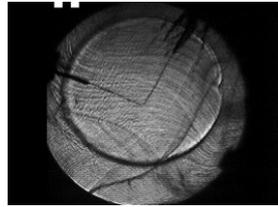
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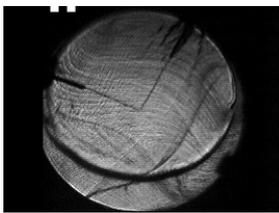
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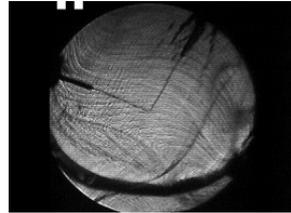
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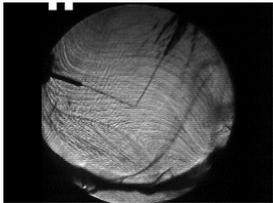
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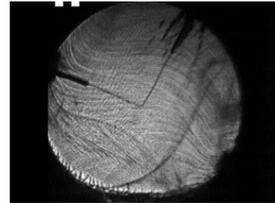
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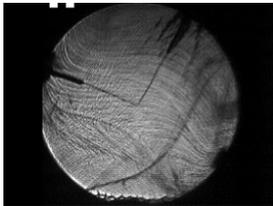
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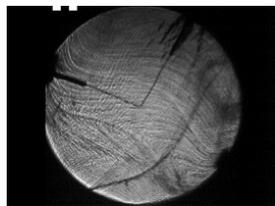
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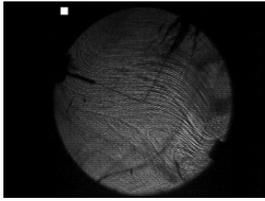
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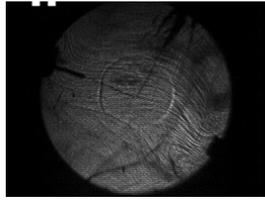
10

. $\Phi = 1.05$, $T_i = 373$ °K, $P_i = 1$ atm:

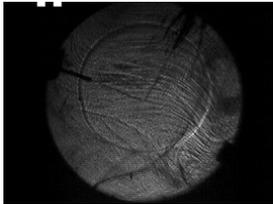
:(11)



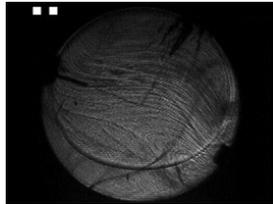
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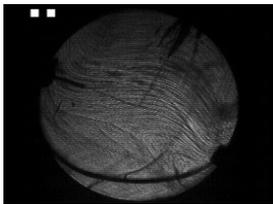
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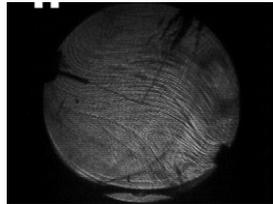
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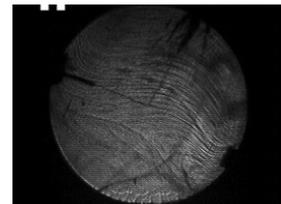
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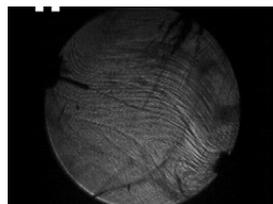
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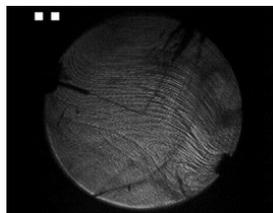
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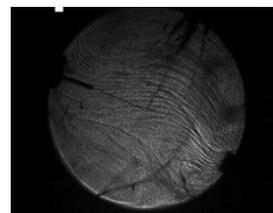
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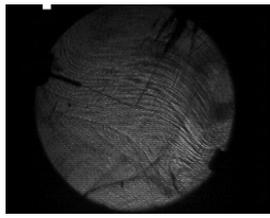
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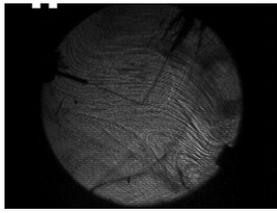
10

. Φ = 1.1, Ti= 453 °K,Pi= 1 atm.:

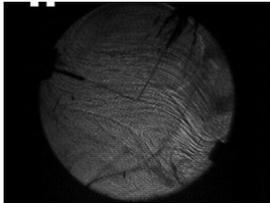
:(12)



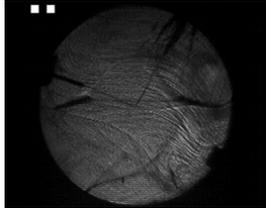
1



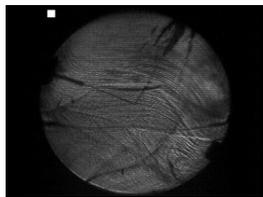
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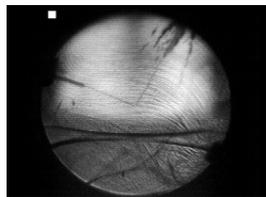
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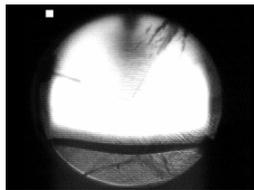
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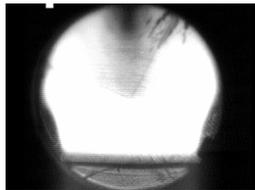
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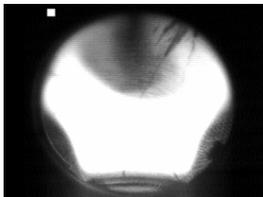
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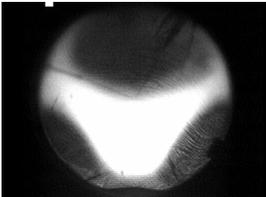
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. Φ = 1.4, T_i = 453 °K, P_i = 1 atm:

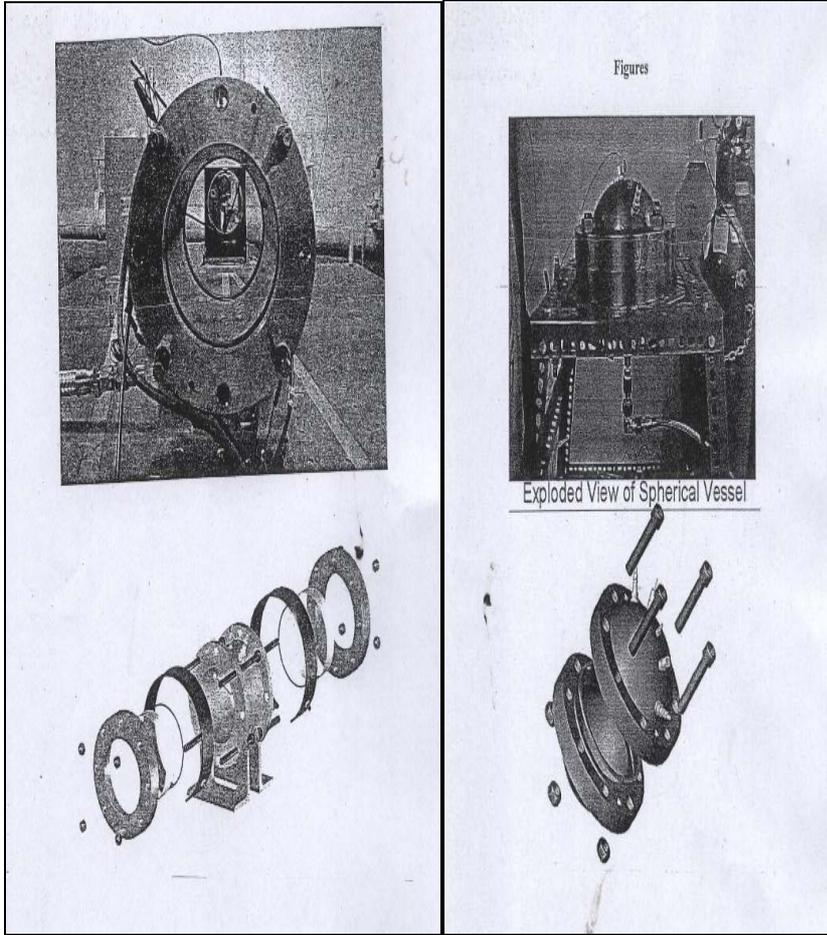
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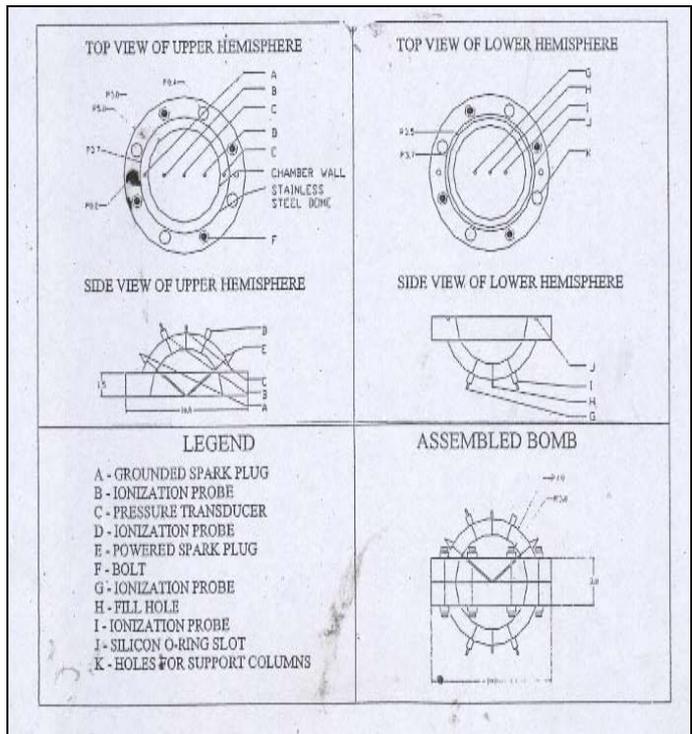
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(3)

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