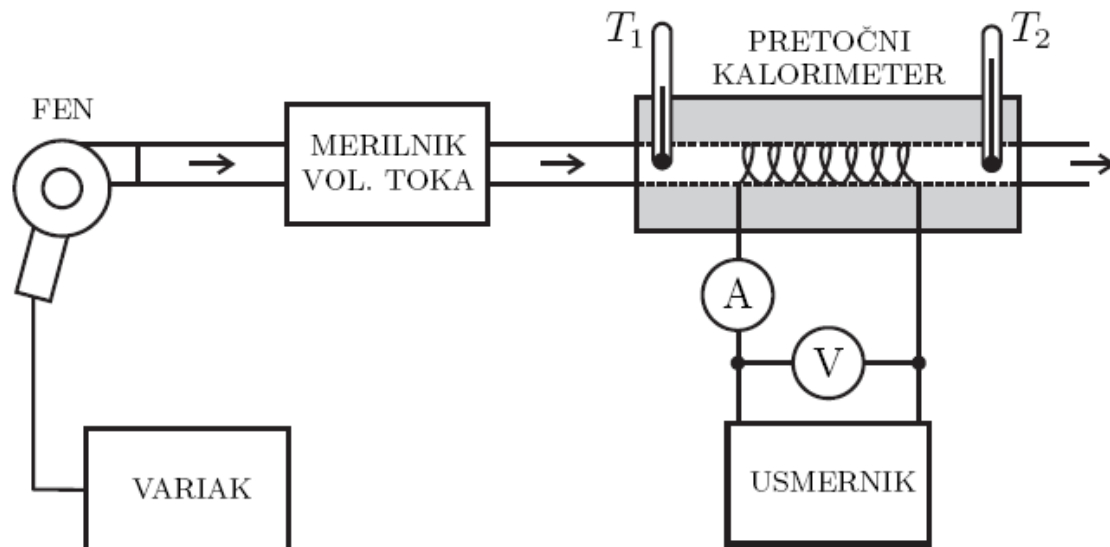


Vaja 4: Pretočni kalorimeter

Skica poskusa:



Uporabljene enačbe:

$$Q = mc_p \Delta T$$

$$P = \Phi_m c_p \Delta T$$

$$P = UI$$

$$\Phi_m = \rho \Phi_V$$

$$\rho_s = \frac{\rho}{M} RT_s$$

$$\Phi_V = \frac{(V_2 - V_1)}{\Delta t}$$

$$c_p = \frac{PRT_s}{\Phi_V \rho_s M \Delta T}$$

Rešitev naloge:

1.

$$T_s = 296K$$

$$p_s = 990\text{mbar} = 99000\text{Pa} = 99000 \frac{N}{m^2}$$

$$U = 13,18V$$

$$I = 0,51A$$

$$V_1 = 6177570l$$

$$V_2 = 6177900l$$

$$\Delta t = 94,74s$$

$$T_1 = 26,7^\circ C$$

$$T_2 = 28,1^\circ C$$

$$M = 29 \frac{kg}{kmol}$$

$$R = 8314 \frac{J}{kmol \cdot K}$$

$$P = UI = 13,18V \cdot 0,51A = \underline{6,7218W}$$

$$\Phi_V = \frac{(V_2 - V_1)}{\Delta t} = \frac{(6177900l - 6177570l)}{94,74s} = \frac{330l}{94,74s} = \underline{3,48 \frac{l}{s}} = \underline{0,00348 \frac{m^3}{s}}$$

$$\Delta T = T_2 - T_1 = 28,1^\circ C - 26,7^\circ C = \underline{1,4^\circ C} = \underline{1,4K}$$

$$c_p = \frac{PRT_s}{\Phi_V p_s M \Delta T} = \frac{6,7218J \cdot 8313J \cdot 296K \cdot s \cdot m^2 \cdot kmol}{s \cdot kmol \cdot K \cdot 0,00348m^3 \cdot 99000N \cdot 29kg \cdot 1,4K} \doteq \underline{1182,48 \frac{J}{kg \cdot K}}$$

$$c_{p,literatura} = 1013 \frac{J}{kg \cdot K}$$

$$\frac{c_p - c_{p,literatura}}{c_{p,literatura}} \doteq 0,1673 = \underline{16,73\%}$$

2.

	X	ΔX	r_x (%)
T_s	296	0,5	0,17%
ρ_s	990	5	0,50%
P	6,7218	0,01	0,15%
Φ_V	330	0,5	0,15%
ΔT	1,4	0,1	7,14%

Meritev razlike temperatur prispeva največji pogrešek.

Opomba:

Vzrok za tako veliko odstopanje je v preveliki napajalni napetosti fena in s tem prevelikim volumskim pretokom, zato je razlika temperatur zelo majhna.