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**DEPARTEMENT:** PETROLEUM ENGINEERING

QUESTION 1.

Hydrogen gas is maintained at 4 bar and 1 bar on the opposite side of a membrane of 0.5mm thickness. At this temperature the diffusion coefficient is 8.7 x 10-8 m2/s. The solubility of hydrogen in the material which depends on the pressure is 1.5 x 10-3m2/s bar. Determine the mass diffusion rate of hydrogen through the membrane.

Solution

C1 = 1.5 x 10-3 x 4 = 6 x 10-3 kg mol/m3

C2= 1.5 x 10-3 x 1 = 1.5 x 10-3 kg mol/m3

Considering plane wall condition

R = L = 0.0005

 DA 8.7 X 10-8 X 1

Mole flux = (6 x 10-3 – 1.5 x 10-3) / 0.0005

 8.7 x 10-8 x 1

 = 7.83 x 10-7 kg mol/m2s.

Mass flux = 2 x 7.83 x 10-7 kg/m2s = 1.566 x 10-6 kg/m2s