**Problems**

13.1 A 1-ft diameter packed column is used to scrub a soluble gas ( ) from an air-gas mixture. Pure water enters the top of the column at . The entering gas stream contains soluble gas and air. Ninety-five percent of the soluble gas is removed. Both the operating line and equilibrium curve may be assumed to be straight. The equation for the equilibrium curve is , where mole fractions. The entering gas mixture flow rate is . The column operates at and 1 atm , and

Don't consider correction factor .

Calculate or find:  
a. Concentration of the soluble gas in the effluent liquid if the column is operated at minimum liquid flow rate  
b. Concentration of soluble gas in the liquid at a point in column where   
c.   
d. Height of packed section,   
e.   
f. Whether column is in danger of flooding if it is packed with -in. ceramic Raschig rings

13.2 A gas stream containing a valuable hydrocarbon is scrubbed with a nonvolatile oil , specific gravity 0.90 ) in a tower packed with 1-inch Raschig rings. The entering gas analyzes 20 mole percent hydrocarbon with the remainder being an inert gas . The gas stream enters the column at , and hydrocarbon-free oil enters the top at . The column is 4 ft in diameter. Ninety-five percent of the valuable hydrocarbon is to be recovered.  
Use the equilibrium relationship and the equations for and given below. Estimate the height of packing required.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | 0.1 | 0.2 | 0.25 | 0.3 | 0.4 | 0.45 | 0.5 |
|  | 0.01 | 0.027 | 0.041 | 0.06 | 0.122 | 0.163 | 0.2 |
|  | | | | | | | |