Supporting information

Scale-up of the radial packing length in rotating packed beds for deaeration processes

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A. Gas and liquid densities

The density calculation is based on the data from the VDI Wärmeatlas.[1]

For water density (ρ_{H_2O}) a polynomial function was fitted to the available data between 6°C and 36°C.

$$\rho_{H_2O} = -0.0052821 \cdot (T_C + 273.15)^2 + 2.8962 \cdot (T_C + 273.15) + 603.12 \left[\frac{kg}{m^3}\right]$$

For the nitrogen density (ρ_{H_2O}) the data was fitted between 0°C and 40°C

$$\rho_{N_2} = -0.003947 \cdot T_C + 1.2312 \left[\frac{kg}{m^3}\right]$$

B. Henry coefficient

The calculation of the Henry volatility coefficient ($K_H^{p,x}$) O_2/H_2O is based on the Database APV84 Henry-AP at atmospheric conditions.

$$\ln\left(K_H^{p,x}\right) = \ln\left(\frac{py_i}{x_i}\right) = \left(A + \frac{B}{T_K} + C \cdot \ln(T_K) + D \cdot T_K + E \cdot T_K^2\right) \cdot 10^{-5} \left[\frac{mol \cdot bar}{mol}\right]$$

with

$A = 228.106003$, $B =$-9622, $C =$-31.107, $D = 0.012109$, $E =$0

Which is converted into the concentration based Henry solubility coefficient (H^{CC}) assuming a dilute, aqueous solution and ideal gas-phase behavior.[2]

$$H^{CC} = \frac{1}{K_H^{p,x}} \cdot \frac{\rho_{H_2O}}{M_{H_2O}} \cdot R \cdot (T_C + 273.15) \cdot 10^{-5} \left[\frac{\frac{mol}{m^3}}{\frac{mol}{m^3}}\right]$$

References

(1) Wagner, W.; Kretzschmar, H.-J.; Span, R. D2 Stoffwerte von bedeutenden reinen Fluiden. In *VDI-Wärmeatlas*; Verein Deutscher Ingenieure, Ed.; VDI-Buch; Springer Berlin Heidelberg: Berlin, Heidelberg, 2013; pp 175–356.

(2) Sander, R. Compilation of Henry's law constants (version 4.0) for water as solvent. *Atmos. Chem. Phys.* **2015**, *15*, 4399–4981.