C$_2$H$_2$

CO$_2$

CH$_3$CHO

CH$_3$COOCH=CH$_2$ (VAc)

Gas

Liquid

C$_2$H$_2$-VAc

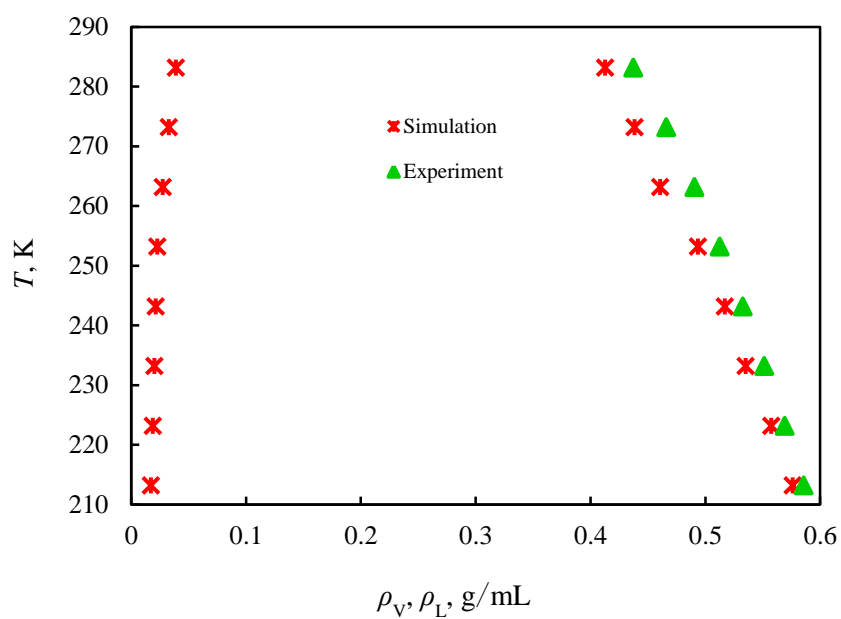**Figure 1.** Molecular structures and equilibrium configuration of gas/liquid phase box in GEMC simulation.

Figure 2. Temperature vs. saturated density for the vapor-liquid phase coexistence of C_2H_2 (red: simulation results, green: experimental data[39]).
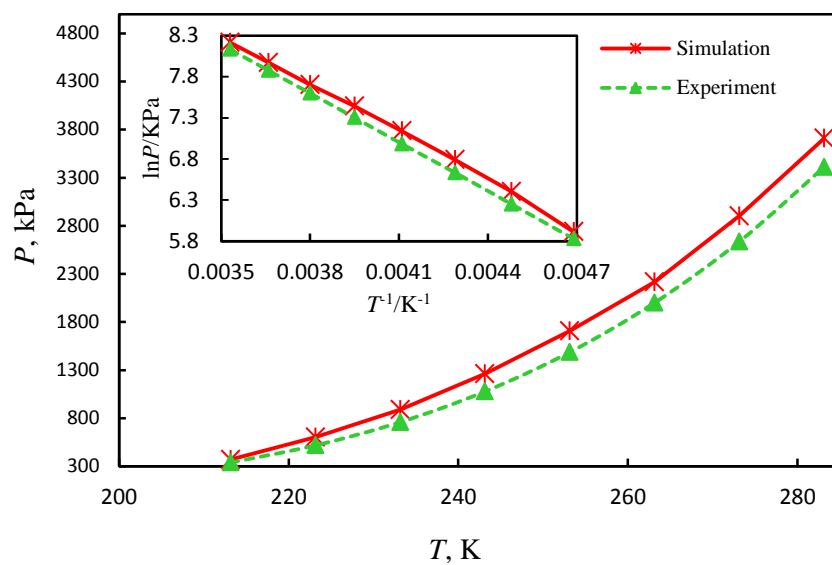
Figure 3. Pressure vs. temperature for the vapor-liquid phase coexistence of C_2H_2 (red: simulation results, green: experimental data[39]).
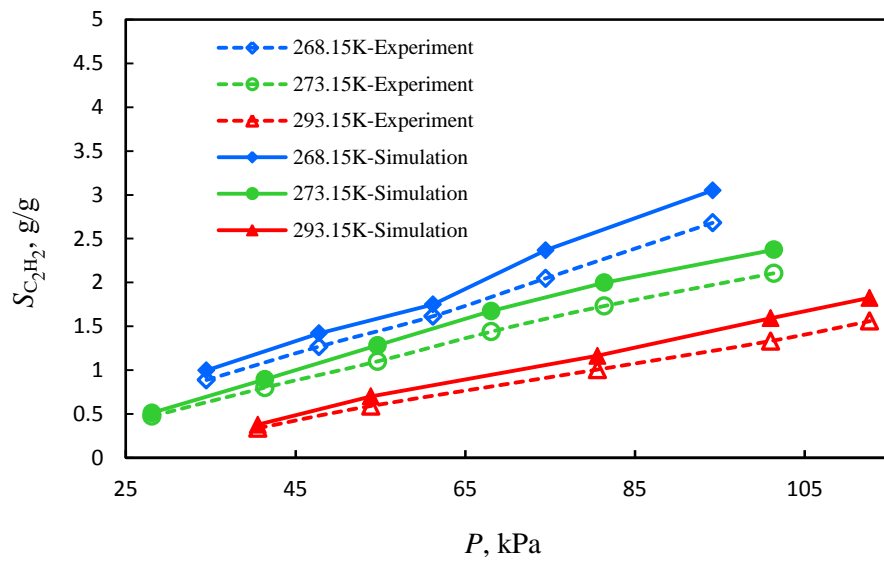
Figure 4. Solulibity of C_2H_2 in the VAc solution at different temperature and pressure (point solid line: simulation results, point dotted line: experimental data[40]).
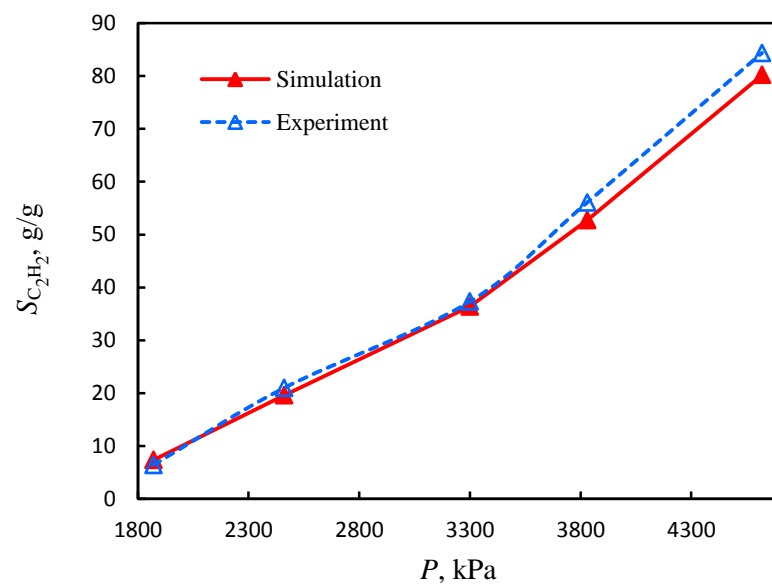
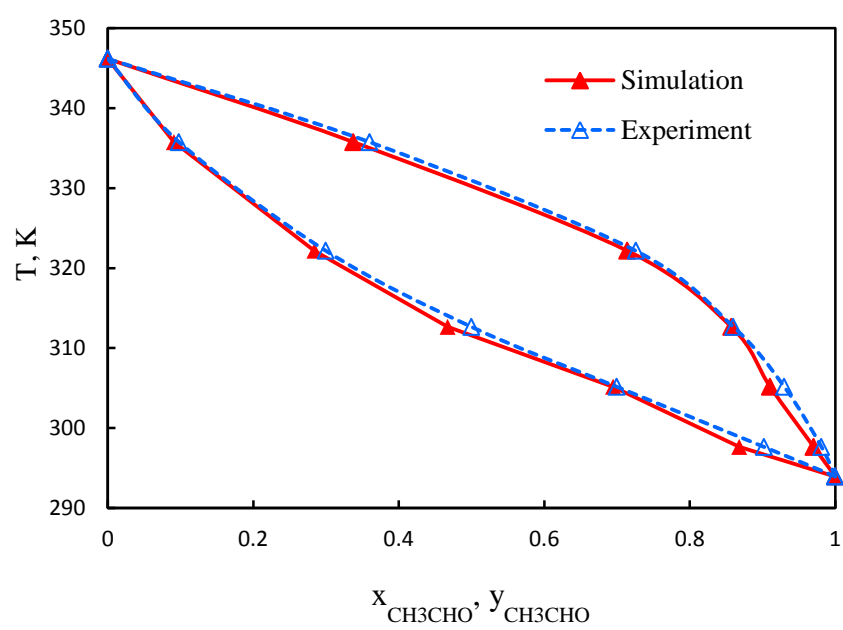**Figure 5.** Solubility of CO_2 in the VAc solution at 313.15 K.

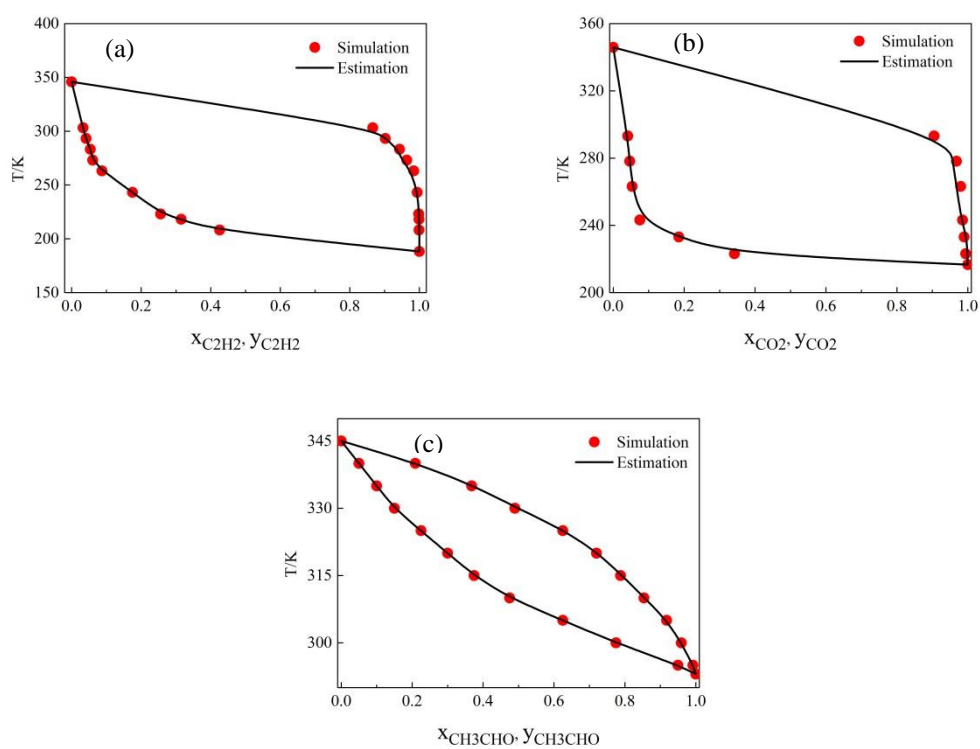**Figure 6.** *T*-x-y curves for the CH$_3$CHO-VAc system at *P*=101.325kPa.

Figure 7. *T-x-y* curves of the binary systems, a: C_2H_2-VAc, b: CO_2-VAc, c: CH_3CHO-VA_C (points: GEMC calculation values, lines: estimation values of UNIQUAC-RK model).
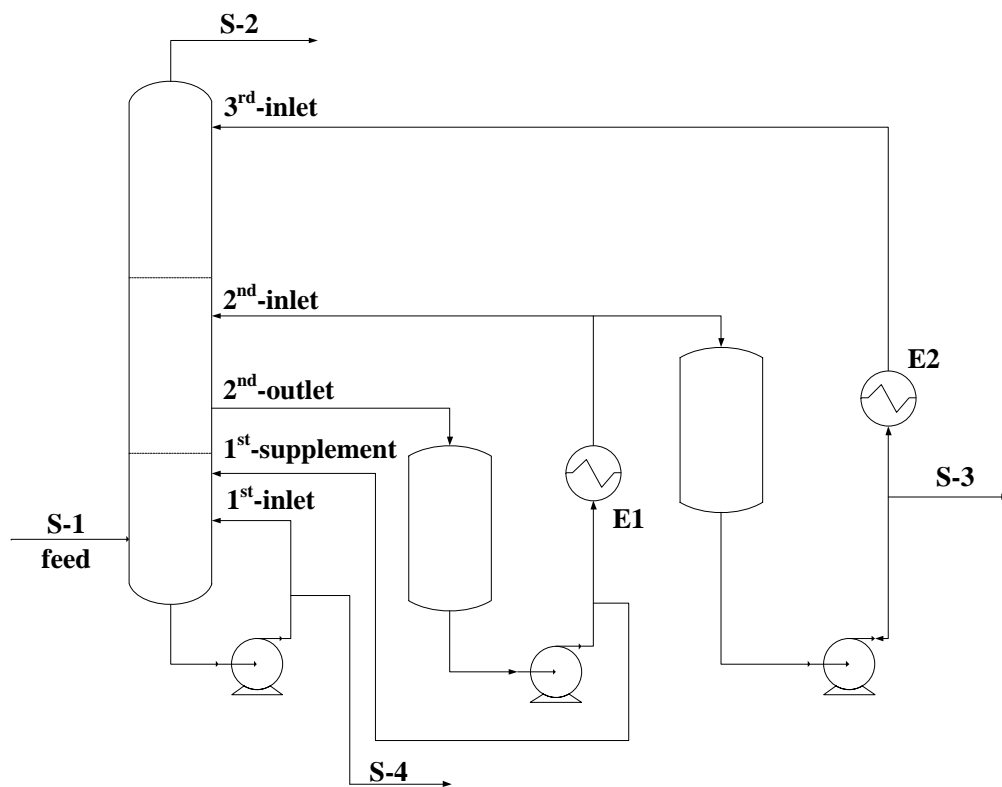
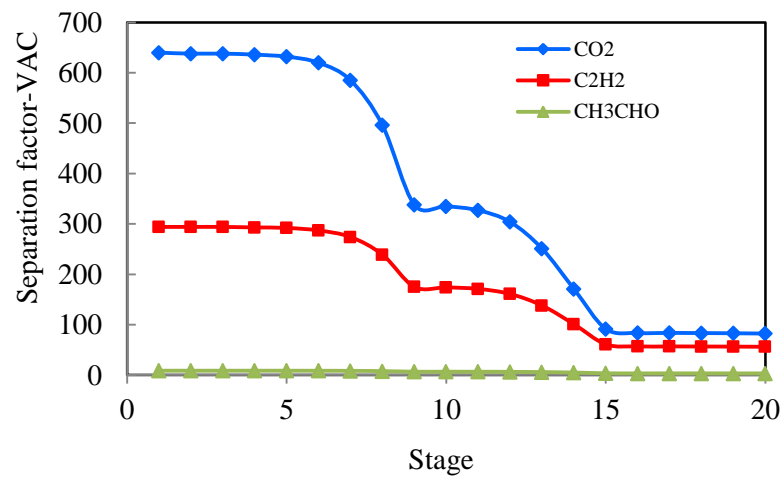**Figure 8.** Flow diagram of the gas separation column.

Figure 9. Separation factor between the light components and VAc with the stage.