

Mass Transfer Performance of a Tray Type Bubble Column Reactor

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Mass Transfer characteristics of a Tray Type Bubble Column Reactor were investigated in this study. Air-Sodium Sulfite system was used for the purpose of studying mass transfer between phases. A high volumetric mass transfer coefficient (KLa) value was obtained with the use of trays, due to the reduced coalescence of bubbles along the flow. KLa for a range of superficial gas velocity (4–8 cm/sec), superficial liquid velocity (0–0.18 cm/sec), tray holes diameter (0.6 cm, 0.91 cm & 1.74 cm), and trays free area (5.3%, 10.3% & 18.9%) were investigated. The effect of a gas sparger was also examined with hole diameter of 0.7 mm and 1 mm. The effect of trays/baffles on energy consumption was evaluated in terms of pressure drop. The catalyst ($2.5 \times 10^{-7} \text{M} \text{ -CoSO}_4$) was used for the experiments. It was found that KLa increases with the superficial gas velocity and the superficial liquid velocity. The effect of tray and sparger hole diameter was opposite. Also, it was observed that KLa increases with an increase in the free area of the holes of the trays. In the presence of trays, up to 4.6 times increase in KLa causes only 1.2 times increase in the pressure drop. Hence the mass transfer performance is greatly improved at the cost of little energy consumption.