6.0 Conclusions

Based on the previous discussions and on the data presented in Figures 3 through 32 the following conclusions have been drawn:

1. Gas holdup in two-phase (gas-liquid) bubble columns is strongly influenced by gas superficial velocity and liquid physical properties such as surface tension and viscosity.

2. The correlation of Akita and Yoshida[9] adequately represents gas holdup in the two-phase air-water system.

3. Gas holdup in three-phase (gas-liquid-solid) systems is significantly influenced by gas superficial velocity, solids particle size and concentration, and, to a lesser extent, slurry superficial velocity.

4. In beds of large particles that tend to accumulate and form a gradient, the effect of solids concentration on gas holdup can be explained in terms of bed expansion and contraction, phenomena more typical of high-solids-content beds of fluidized solids.

5. For smaller particles in dilute suspension, the mechanisms stated in Conclusion 4 are not applicable. The system may be better characterized as pseudo two-phase and, in most cases, can be accurately described using existing two-phase mechanisms.

6. Solids withdrawal rates as high as 15 volume percent of the feed rate to the column do not significantly affect gas holdup.

7. At atmospheric conditions, a continuous solids withdrawal system has significant advantages over an intermittent withdrawal system providing smoother flow and a lesser degree of plugging. These advantages may not be significant for pressurized vessels.

8. Backmixing in tall bubble columns is not as extensive as initially expected. Quantitative studies to provide a solid basis for more definitive conclusions are needed.