## LIST OF FIGURES

Figure No	Caption	Page No
Figure 2.1	Flow regimes in bubble columns	9
Figure 2.2	Parameters defining bubble shape for ellipsoidal bubbles	24
Figure 2.3	Different bubble shapes	24
Figure 3.1	Experimental Set-up for bubble column	46
Figure 3.2	Results of the image processing tools	50
Figure 4.1	Image of air-water dispersion in bubble column	55
Figure 4.2	Variation of $H_e$ with time at different $U_g$ and $H_s$ for air water system	55
Figure 4.3	Effect of $U_g$ on pixel density as a function of $H$	56
Figure 4.4	Variation of $H_e$ with time at different $U_g$ and $H_s$ for air water system	56
Figure 4.5	Variation of ACF with time at different $U_g$ and $H_s$ for air water	57
	system	
Figure 4.6	ACF vs time for $U_g = 0.168$ m s <sup>-1</sup> and $H_s = 0.145$ m	58
Figure 4.7	$\tau$ vs $U_g$ as a function of $H_s$	59
Figure 4.8	Comparison of $f_w$ with correlations	62
Figure 4.9	$f_w$ as a function of $U_g$ and $H_s$	63
Figure 4.10	$e_w$ as a function of $U_g$ and $H_s$	64
Figure 4.11	Correlation between gas holdup calculated by height measurement	66
	and pixel intensity	
Figure 4.12	Variation of $\varepsilon$ with $U_g$ at $H_s = 0.20$ to 0.28 m for air water system	66
Figure 4.13	Drift flux diagram- $U_g$ (1- $\varepsilon$ ) vs $U_g$ at $H_s = 0.20$ to 0.28 m for air	67
	water system	
Figure 4.14	Variation of $\varepsilon$ with $U_g$ at $H_s = 0.2$ m for air-CMC soln. system at	68

CMC Conc. = 0.5, 1.0, 2.0 and 3.0 % (w/w).

Figure 4.15	Drift flux diagram- $U_g$ (1- $\varepsilon$ ) vs $U_g$ at $H_s = 0.2$ m for air-CMC soln. system	68
Figure 4.16	BSD for distilled water at $U_g = 0.0416 \text{ m s}^{-1}$ , $H_s = 0.23 \text{ m}$ .	70
Figure 4.17	Effect of $U_g$ on BSD for air-water at $H_s = 0.23$ m	70
Figure 4.18	Effect of $H_s$ on BSD for air-water at $U_g = 0.0167 \text{ ms}^{-1}$	71
Figure 4.19	Effect of $H_s$ on BSD for air-water at $U_g = 0.0417 \text{ ms}^{-1}$	72
Figure 4.20	BSD for 1.0%(w/w) CMC solution at $U_g = 0.0416 \text{ m.s}^{-1}$ , $H_s = 0.23 \text{ m}$ .	73
Figure 4.21	Effect of $U_g$ on BSD for 1.0 % (w/w) CMC solution at $H_s = 0.23$ m.	74
Figure 4.22	Effect of conc. on BSD for aq. CMC soln. at $U_g=0.0375 \text{ ms}^{-1}$ , $H_s=0.23 \text{ m}$ .	74
Figure 4.23	Variation of $d_{32}$ as a function of $U_g$ and $H_s$ .	76
Figure 4.24	Variation of $d_{32}$ with $U_g$ at various CMC conc.	77
Figure 4.25	E for air/water at $U_g=0.0083 \text{ m s}^{-1}$ , $H_s=0.2 \text{ m}$ .	79
Figure 4.26	Variation of $a_i$ with $U_g$ and $H_s$ for air-water system	80
Figure 4.27	Variation of $a_i$ with $U_g$ and CMC concentration at $H_s = 0.23$ m.	80
Figure 4.28	Schematic sketch of the model	83
Figure 4.29	Comparison of kL estimated by present method with that using correlations of Akita et al(1974), Pohorecki (2001) and Pohorecki (2001).	86
Figure 4.30	Comparison of $a_i$ estimated by present method with that using correlations of Akita et al(1974), Pohorecki (2001) and Pohorecki (2001).	87
Figure 4.31	Comparison of $(k_L.a_i)$ estimated by present method with that using correlations of Akita et al(1974), Pohorecki (2001) and Pohorecki (2001).	88
Figure 4.32	Comparison of $(k_L.a_i)$ estimated by present method with that using correlations of Akita et al(1974), Pohorecki (2001) and Pohorecki (2001).	88
Figure 4.33	Average bubble position and velocity assumed in a bubble column	90
Figure 4.34	Comparison of values of gas holdup estimated from Equations 5.27	93
	and 5.28 with data of Esmaeili et al. (2015).	