Other Particle Size Effects

In sections (Njh), (Nji), (Njj) we outlined one class of circumstances in which bubble fission is an important facet of the disperse phase dynamics. It is, however, important, to add, even if briefly, that there are many other mechanisms for particle fission and fusion that may be important in a disperse phase flow. When the particles are sub-micron or micron sized, intermolecular and electromagnetic forces can become critically important in determining particle aggregation in the flow. These phenomena are beyond the scope of this book and the reader is referred to texts such as Friedlander (1977) or Flagan and Seinfeld (1988) for information on the effects these forces have on flows involving particles and drops. It is however valuable to add that gas-solid suspension flows with larger particles can also exhibit important effects as a result of electrical charge separation and the forces that those charges create between particles or between the particles and the walls of the flow. The process of electrification or charge separation is often a very important feature of such flows (Boothroyd 1971). Pneumatically driven flows in grain elevators or other devices can generate huge electropotential differences (as large as hundreds of kilovolts) that can, in turn, cause spark discharges and consequently dust explosions. In other devices, particularly electrophotographic copiers, the charge separation generated in a flowing toner/carrier mixture is a key feature of such devices. Electromagnetic and intermolecular forces can also play a role in determining the bubble or droplet size in gas-liquid flows (or flows of immiscible liquid mixtures).