

tablets held in suspension by a column of air. Fluid bed processing equipment is multi-functional and may also be used in preparing tablet granulations.

In the Wurster process, named after its developer, the items to be coated are fed into a vertical cylinder and are supported by a column of air that enters from the bottom of the cylinder. Within the air stream, the solids rotate both vertically and horizontally. As the coating solution enters the system from the bottom, it is rapidly applied to the suspended, rotating solids, with rounding coats being applied in less than an hour with the assistance of warm air blasts released in the chamber.

In another type of fluid bed system, the coating solution is sprayed downward onto the particles to be coated as they are suspended by air from below. This method is commonly referred to as the *top-spray* method. This method provides greater capacity, up to 1,500 kg, than the other air suspension coating methods (20). Both the top-spray and bottom-spray methods may be employed using a modified apparatus used for fluid bed granulation. A third method, the *tangential-spray technique*, is used in rotary fluid bed coaters. The bottom-spray, top-spray, and tangential-spray methods are depicted in Figure 8.21. Electron microscope images of the results of this process are shown in Figure 8.36.

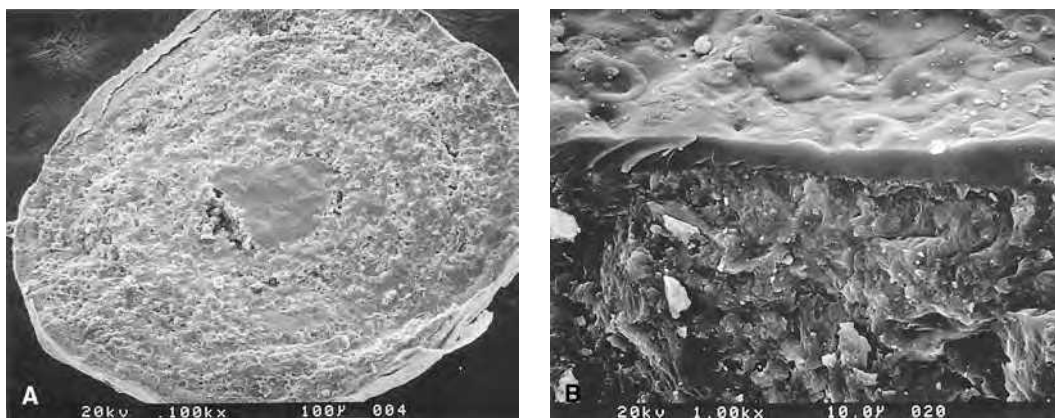
The three systems are increasingly used for application of aqueous or organic solvent-based polymer film coatings. The top-spray

coating method is particularly recommended for taste masking, enteric release, and barrier films on particles or tablets. It is most effective when coatings are applied from aqueous solutions, latexes, or hot melts (17,18). The bottom-spray method is recommended for sustained-release and enteric-release products; the tangential method is used for layering coatings and for sustained-release and enteric-coated products (18).

Among the variables requiring control to produce the desired and consistent quality are equipment and the method of spraying (e.g., top, bottom, tangential), spray nozzle distance from spraying bed, droplet size, spray rate, spray pressure, volume of the air column, batch size, method and time for drying, and air temperature and moisture content in the processing compartment (18).

### Compression Coating

In a manner similar to the preparation of multiple compressed tablets having an inner core and an outer shell of drug material, core tablets may be sugarcoated by compression. The coating material, in the form of a granulation or powder, is compressed onto a tablet core of drug with a special tablet press. Compression coating is an anhydrous operation and thus may be safely employed in the coating of tablets containing a drug that is labile to moisture. Compared to sugarcoating using pans, compression coating is



**FIGURE 8.36** Scanning electron microscope images of pharmaceutical granules coated through fluid bed technology: **A:** Layered and coated granule. **B:** Cross section of top-spray enteric-coated granule. (Courtesy of Glatt Air Techniques.)