

Chemical Blowing Agents

Most conventional plastic processes can utilize chemical blowing agents (CBAs), also known as foaming agents. CBAs are added to the polymers during processing to form minute gas cells throughout the product. The gas is liberated by a chemical change in the CBA. The foamed cellular structure reduces polymer density, saves in material costs, improves electrical and thermal insulative properties and increases the strength-to-weight ratio. Foamed plastics include such diverse products as food containers, foamed core pipe, vinyl sheet, simulated leather and structural foam wood grain furniture.

The liberation of gas when heating chemical foaming agents occurs through a chemical reaction or decomposition. Different chemical foaming agents have different decomposition temperatures depending on their chemical structure, and specific chemical foaming agents can be selected for particular applications.

The most used CBA for medium temperature polymer processing (325-430°F) is azodicarbonamide. Polymers using azo include polystyrene, polypropylene, high and low density polyethylene, ABS and PVC.

Azo is a nonflammable, non-toxic yellow-orange solid which decomposes exothermically at approximately 400°F. About 220 ml of gas is released per gram of azo. The gas is comprised of approximately 65% nitrogen, with a mixture of other gases. The non-toxic residue is white and contains several heterocyclic nitrogen compounds.

In addition to azodicarbonamide, there are several other hydrazine-based chemical blowing agents such as benzene- and toluenesulfonylhydrazide, which are used in lower temperature applications. Oxybisbenzenesulfonylhydrazide decomposes at slightly higher temperatures.

Indirectly made from hydrazine, is the high-temperature blowing agent, 5-phenyltetrazole, which is used in several engineering plastics.