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AEC-NASA TECH BRIEF

Evaluating Foam Heterogeneity

Heterogeneity in a plastic foam can have adverse affects on physical properties such as rigidity and strength. Further, it can complicate the forming, curing and aging processes of the foam since the foam composition is non-uniform.

A new analytical tool is now available to calculate the degree of foam heterogeneity based on the measurement of gas diffusivity values. The diffusion characteristics of plastic foam are described by a system of differential equations based on conventional diffusion theory. The theoretically obtained results were compared to experimentally determined values to provide the required correlations.

The foam structure is considered as a three dimensional array of homogeneous cubicle cells on the macro-scale. One and two dimensional mathematical models of gas diffusion were constructed and used to determine the gas diffusivity values of oxygen, nitrogen and n-pentane in .048 and .096 gm/cm3 density plastic foams at temperatures of 25°, 50° and 75° C. Diffusivity values of the same gases in polystyrene were determined for comparison. Both sets of data were used to determine the relationship between gas diffusivity and heterogeneity.

This mathematical approach saves significant research effort and computing time in studying mass or heat diffusion problems. The correlation between gas diffusivity and heterogeneity may be useful in determining material properties and as a quality control tool for manufacturers of plastic foam.

Notes:

1. The following documentation may be obtained from:

   National Technical Information Service
   Springfield, Virginia 22151
   Single document price: $3.00
   (or microfiche $0.95)

   Reference: BDX-613-229 (N71-16372), A New Technique for Determining Gas Diffusivity in Heterogeneous Media-Plastic Foam

2. Technical questions may be directed to:

   Mr. Glenn K. Ellis
   Technology Utilization Officer
   Office of Information Services
   U.S. Atomic Energy Commission
   Washington, D.C. 20545
   Reference: TSP72-10365

Source: D.W. Liou, and
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