AEC-NASA TECH BRIEF

Characteristics of Fluidized-Packed Beds

Fluidization techniques are well known for their application to solid-gas contactors where high production rates and good heat transfer are required. Although extensive work has been done on the heat transfer and other aspects of fluidized beds and packed beds separately, few reports have been published on the combination fluidized-packed bed. Because of the limited data available, research was undertaken on the heat transfer, solids-gas mixing, and elutriation of the fluidized-packed bed.

A fluidized-packed bed is a system involving the fluidization of small particles in the voids of a packed bed of larger nonfluidized particles. This bed has found application in the development of a fluoride volatility process for the recovery of fissionable values from spent uranium dioxide reactor fuels. In this process, a highly exothermic fluorination is carried out. The uranium dioxide pellets are too large to be fluidized directly, but the addition of inert fluidized alumina grain has improved heat and mass transfer from the reacting surfaces of the pellets.

In the study, investigations are made of bed expansion, pressure drop, heat transfer, solids mixing, gas mixing, and fines elutriation. Data and theoretical discussions of the mechanisms are presented. In addition, the empirical and theoretical results are applied to process design and, where possible, compared with pilot-plant data.

The investigations illustrate that heat transfer is markedly better for fluidized-packed beds than for comparable packed beds. On the other hand, the presence of packing results in lower rates of heat transfer in the fluidized-packed bed than the rates for usual modes of fluidization. Eddy diffusivities of gas in the radial direction are nearly the same as for beds with the same type of packing, but without the fluidizing material. Measured rates of elutriation of fine particles from a fluidized-packed bed are less than those from a comparable fluidized bed (no packing). Mixing rates of solid particles show values comparable to those obtained from heat-transfer rates.

Notes:

1. The study of fluidized-packed beds has been conducted by John D. Gabor and William J. Mecham of Argonne National Laboratory. Their report, "Fluidized-Packed Beds: Studies of Heat Transfer, Solids-Gas Mixing, and Elutriation," has been published as Part 4 of a larger report entitled "Engineering Development of Fluid-Bed Fluoride Volatility Processes," ANL-6859, Argonne National Laboratory, March 1965. The report is available from the Clearinghouse for Federal Scientific and Technical Information, Springfield, Va. 22151; price $3.00, microfiche copies $0.65.
2. Inquiries concerning this innovation may be directed to:

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   Reference: B68-10278
   Source: J. D. Gabor and W. J. Mecham,
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Patent status:

Inquiries about obtaining rights for commercial use of this innovation may be made to:

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