

## Development of 3-D Multicomponent Mixture Analysis (GAMMA) Code for Pebble-Bed Safety Analysis in a HTGR

Hong Sik Lim

Korea Atomic Energy Research Institute  
150 Dukjin-dong, Yuseong-gu, Taejon, Korea 305-353

Hee Cheon NO

Korea Advanced Institute of Science and Technology  
373-1 Guseong-dong, Yuseong-gu, Taejon, Korea 305-701

### Abstract

We developed a multi-dimensional GAs Multicomponent Mixture Analysis (GAMMA) in order to investigate molecular diffusion, chemical reactions, and natural convection related to the air ingress phenomena during the primary-pipe rupture accident. In addition, GAMMA can handle the core thermal-hydraulic characteristics in a pebble bed-type gas cooled reactor. The Implicit Continuous Eulerian (ICE) technique is adopted for the reduction of  $10N \times 10N$  matrix into  $N \times N$  pressure difference matrix and fast transient computation. In the simulation of a SANA-1 afterheat self-removal test, the predicted results of GAMMA agree closely with the measured temperature profiles and are comparable to those of other analysis codes (TINTE, THERMIX, and TRIO-EF).