Effect of grain coarsening on the thermal compatibiliy of atomized U-10wt.%Mo particles dispersed in aluminum

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Abstract

The effect of grain coarsening on the thermal compatibiliy of atomized U-10wt.%Mo particles dispersed in aluminum were examined. Coarsened U-10wt.%Mo particles have better thermal compatibility with aluminum matrix in a dispersion fuel compatibility at elevated temperature than as-atomized powder. The possible reasons for a better thermal compatibility have been considered to be as follows. While the as-atomized particles have a Mo-depleted zone in the cell boundary with the cell size of ~2 m, the coarsened particles, quenched after annealing at 1073oK for 100 hrs, have a homogenized microstructure with the grain size of ~25 m. The coarsened microstructure of the annealed particles can delay the nucleation time of -U phase in the grain boundary relative to the as-atomized particles. In addition, the coarsened grains decrease grain boundary areas, and lead to the decrease in nucleation rate. This stable -U phase metastability retards the diffusion of Al atoms in the homogenized particles. The penetration mechanism of aluminum atoms in the atomized particles is assumed to be diffusion through the reacted layer between fuel particles and Al matrix, leaving a kernel-like unreacted island.