A07

2단 소결공정으로 제조된 산화물 분산강화 텅스텐중합금의 미세조직 및 기계적성질

Microstructure and mechanical properties of two-stage sintered ODS tungsten heavy alloy

이경호*[1], 차승일[1], 류호진[2], 홍순형[1]

[1]한국과학기술원, [2]한국원자력연구소

Oxide dispersion strengthened (ODS) tungsten heavy alloys have been considered as promising candidates for novel kinetic energy penetrator due to theircharacteristic fracture mode compared to conventional tungsten heavy alloy. However, in order to obtain high relative density during liquid phase sintering, the high sintering temperature and long sintering time are required, which induces large tungsten grain size. Therefore, it is very difficult to obtain controlled microstructure of ODS tungsten heavy alloy into fine tungsten grain with full densification. In this study, the two-stage sintering process, consisting of primary solid state sintering and following secondary quick liquid phase sintering, was introduced for ODS tungsten heavy alloys. The mechanically alloyed 94W-4.56Ni-1.14Fe-0.3Y_2O_3 powders are solid state sintered at 1300-1450°C for 1hr in hydrogen atmosphere, and followed by rapid heating to liquid phase sintering temperature of 1465-1485°C. The microstructure of ODS tungsten heavy alloys showed high relative density about 97%, with contiguous tungsten grains after primary solid state sintering process. The microstructure of solid state sintered ODS tungsten heavy alloy was changed into spherical tungsten grains embedded in W-Ni-Fe matrix during secondary liquid phase sintering. The two-stage sintered ODS tungsten heavy alloys from mechanically alloyed powder showed finer microstructure and higher mechanical properties than conventional liquid phase sintered ODS tungsten heavy alloy. The mechanical properties of ODS tungsten heavy alloys are dependent on the microstructural parameters, such as tungsten grain size, matrix volume fraction and tungsten/tungsten contiguity, which can be controlled through the two-stage sintering process.