B10

MA-SHS 공정으로 제조된 Cu-TiB_2 나노 복합 분말과 Cu의 혼합 공정에 따른 Cu-TiB_2 최종 소결체의 미세조직과 특성변화

Effect of Addition Methods of Cu-TiB_2 Nanocomposite Powder Produced by MA-SHS Process to Cu on Microstructure and Property of Cu-TiB_2 sintered Compact

Thuy Dang Nguyen*, 권대환, 최벽파, 김지순, 권영순

울산대학교 첨단소재공학부, 기계부품 및 소재특성평가연구센터,

Copper-based metal matrix composites with reinforcing ceramic particles such as oxides, borides and carbides have previously been developed. Among them, titanium diboride(TiB_2) was also found to be a potential candidate for reinforcement of the copper matrix composites owing to its high melting point, hardness, thermal conductivity and high electrical conductivity.

In the present work, Cu-40 wt.%TiB_2 nanocomposites powder (SHS powder) was synthesized by combining high-energy ball-milling of Cu-Ti-B mixture and subsequent self-propagating high-temperature synthesis (SHS). In order to produce Cu-TiB_2 nanocomposites, the calculated content of SHS powder product was distributed to pure Cu using four addition methods as follows: (i) the SHS-product was mixed with the additional amount of copper powder by a tubular mixer for 2 hours. (ii) SHS-product milled by plenary ball milling at 500 rpm for 10 min was mixed with the additional amount of copper powder in a tubular mixer for 2 hours. (iii) The SHS-product and Cu mixed powder was milled by plenary ball milling at 200 and 300 rpm for 30 and 60 minutes. (iv) SHS powder product milled by plenary ball milling machine at 500 rpm for 10 min was mixed with the copper powder in a tubular mixer for 2 hours, and then this mixture was milled by planetary ball milling at 200 and 300 rpm in 60 and 30 min, respectively. Spark-plasma sintering (SPS) was applied to inhibit grain growth and thereby obtain Cu-TiB_2 bulks with fully density.

The four addition methods could be get the difference results as follows:

(i) The hardness and the electrical conductivity obtain 15,34 H_RB and 87 %IACS.

(ii) The hardness and electrical conductivity obtain 34.38 H_RB and 85.54 %IACS.

(iii) The hardness and electrical conductivity obtain 72.56 H_RB.

(iv) The hardness and electrical conductivity obtain 73.94 H_RB and 82.25 %IACS.