ANALYSIS OF THE EFFECT OF SINTERING TEMPERATURE AND HOLDING TIME ON INTER-FACE BONDING FOR METAL MATRIX COMPOSITES (MMCs) Cu-10%wtSn MADE BY POWDER METALLURGY

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Abstract

Metal matrix composites, including materials that have combination properties of two or more different material with metal as the matrix. One of composites application is used for frangible bullet materials. It’s Cu-10%Sn composite which is designed to have properties easily broken up into pieces when hit the hard surface. Manufacture method that used to make composite is powder metallurgy. Copper and tin powder, with a little Zincstearat lubricant was mixed using magnetic steering. Then it’s compacted with pressure of 600 MPa. Sintering process was done under a nitrogen atmosphere and sintering temperature of 300, 500, 700 °C and holding time sintering is 30, 60, 90 minutes. Increasing in temperature sintering, the diffusion rate increased. At temperature 300 °C, there are two type of infacacial bonding can be formed, interfacial bonding between Cu matrix and intermetallic phase (CuS, Cu6Sn5) and sesame intermetallic phase. At temperature 700 °C, only sesame intermetallic phase (Cu11Sn11, Cu81Sn21) bonding formed. Increasing in holding time, pores size at interfacial bonding increases. Intermetallic phase that formed in interfacial bonding composites Cu-10%Sn is Cu6Sn5, Cu10Sn3, Cu41Sn11, dan Cu81Sn21. Composites that sintered at 500 °C and holding time during 60 minutes is available for frangible bullets application.

Keyword: composite, powder metallurgy, interfacial bonding