

2016

# Influence of sintering temperature on the densification of copper matrix composite reinforced with CoAl particle developed by SHS

**kahina kheloui, Said Azem, Mustapha Nechiche**

**Abstract :** This work focuses on the influence of the sintering temperature of a copper matrix composite and CoAl particles produced by SHS (Self Propagating High temperature Synthesis). In a first step, Co-50at.%Al mixture is sintered at 950°C to obtain the CoAl compound that will be milled for 24 hours and sintered in presence of copper in order to a preparation of a metal matrix composite. Then, the CoAl-50wt. %Cu mixtures are compressed under a pressure of 350MPa and sintered at two different temperatures (solid and liquid phase) under argon. The SEM examination of the composite sintered in solid phase shows the ramifications of copper in CoAl particles, which highlights a diffusion of Cu through the nano pores particles. Some particles present a phase contrast, which reveals the inhomogeneity of diffusion. The EDS-X analysis confirms this result since we find an important quantity of copper inside a particle. The Cobalt and aluminum are also found in the matrix. Moreover, the discontinuity is observed with the interface CoAlCu. It seems that liquid sintering phase would lead to a homogeneous diffusion, better wetting of particles and higher densification. A sphering of CoAl particles is also observed in the case of the composite sintered in liquid phase, which reflects the phenomenon of dissolution-precipitation at the edges of CoAl particles. To a complementary results, X-ray diffraction analysis (XRD) was also performed. The diffractogram of CoAl-Cu composites sintered in liquid phase reveals the presence of Cu and CoAl with shift of the Cu peaks to the left, reflecting an increase in the parameter. This swelling of the mesh of copper is due to the substitution of copper atoms by those of aluminum and cobalt. After the calculation of the open porosity in the composites sintered in liquid and solid phase, we found a better densification of the composite sintered in liquid phase with a rate porosity of 2%.

**Keywords :** composite materials, intermetallics, SHS, SEMEDS X, XRD