THERMAL SPRAYING OF CU10AL POWDER ON COPPER

Ionut Claudiu ROATA[1], Alexandru PASCU[1], Elena Manuela STANCIU[1]

[1]*Transilvania University of Brasov, Romania, e-mail: r.i.claudiu@gmail.com*

Abstract: *In this paper is emphasized the influence of metallizing distance on the microhardness and porosity of the layer coated by using Cu10Al powder. In order to perform the samples, CastoDyn DS800 thermal spraying unit was used and also the SSM 10 metallizing modulus. After the samples analysis, an improvement of the diffusion zone is noticed and also an increasing of the microhardness for the samples where the metallizing distance decreased to 100 mm. The interface with the base material is very good, without detachments, and the screwed aspect resulting from mechanical working, is distinguishable.*

Keywords: *thermal spraying, metallizing distance, Cu10Al powder, microhardness*

1 Introduction

All coating obtained by spraying procedures consists of melting filler materials (wire, rod, or powder) by a heat source (arc, oxygas flame or plasma jet), spraying (atomization) of the melted metal and drops projecting by a high pressure compressed – air jet (4-7 [bar]) on the rough covering surface (with an about 20 [µm] roughness).

When passing from melted metal phase to sprayed drops, due to the compressed air, a fast cooling of the drops and an increase of particles speed takes place. Thus, the particles speed reaches 30-50 [m/s] in flame metallizing and arc process and 250 [m/s] in plasma jet metallizing process.

The kinetic energy with which the particles hit the sample surface depends on the distance towards the sample and the size of the particles. Particles projecting is made cone shaped with the peak in the inner cone or in the nucleus of the arc. The particles that are placed in the tip of the cone cool faster and do not reach the plastic state on the covering surface but they are solidified and heavily oxidized, rebounding from the surface or being placed in the coating as inclusions without adherence. Plastic particles are projected on the sample and their impact with the surface is very strong due to particles high speed. In contact with the base material rough surface, the plastic particles are smashed in the surface roughnesses and stay by them, achieving a mechanical bonding with the base material. The particles that are coated in this manner will gain an irregular configuration, with an emphasized roughness, being an ideal base for staying the proceeding particles [1].

The filler material drops have thermal and kinetic energy and thus they bump on the covering surface, resulting a crushing with liquid drop splutter after which the thermal energy transfer from the drop to the sublayer is achieved, resulting in solidification of the drop. Considering drop temperature over 1.000 [$^{\circ}$C] and that of stand surface under 100 [$^{\circ}$C], the thermal energy transfer from the drop to the stand continues after the drop solidification up to temperatures equalizing, resulting in a considerable thermal shrinkage of coated material and a minor thermal dilatation of the stand. Coated material layer is made of a multitude of fine drops more or less flattened, depending on their thermal and kinetic state during the impact.

The forces between the base material and the material coated by thermal spraying are of a mechanical – adhesive nature over which the