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SPECIAL MULTY-LAYER MATERIALS OBTAINING USING NONCONVENTIONAL METHODS

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Abstract: *The theme propose to treat some aspects about the employment the welding by explosion mechanism in obtaining new materials used in special industries.*

Keywords: *welding, explosion, materials*

1. INTRODUCTION

Several mechanisms have been submitted, in order to define the process of welding through explosion, beginning with the first phases in the research of the phenomenon. Some of these mechanisms suggest that the process, is fundamentally, one of melting.

It is taken into consideration that at the welding-interface, the kinetic energy transforms into thermic energy (accompanied by an energy dissipation), which acts as source of heat, enough to cause bilateral dissolves through the interface, the diffusion of the shells occurring later. This diffusion of the metals into liquid state, takes place gradually, concerning the structure of the welded metals and the distance from the interface.

According to the studies concerning the waves at the welding-interface, "the whims" and the marks of melted and solidified metal cannot be explained through the mechanism of welding in the solid state, or by the dissolving mechanism.

The deformation of the granules at the interface and the appearance of the waves defines that the phenomenon of welding through explosion is based on a hydrodynamic process of inflows.

2. THE TEXT OF THE PAPER

The scientists have experimentally established that during the process of welding, important transversal tensions (of detrusion) form on the interface, resulting an effect of warming of the interface. This phenomenon could lead to an adequate warming of the superficial shells to produce the welding and can also explain the appearance of the waves at the interface [1].

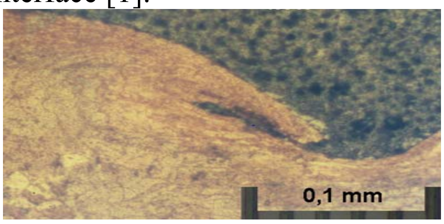

Fig. 1. Example of an interface obtained at the plating through explosion through explosion of the metallic layers

The new testing procedures have revealed that, at the collision of the welding pieces, only a very thin layer of melt forms on the interface. The assigned value of refrigeration of the remained melting layer is 10^5 ^{0}C/s, this value is so high because of the line of contact between the components.

The existence of amorphous layer, inside the welding zone, has been taken into account for different metallic combinations and explained by the scientists as being the material reason of welding through explosion's fundamental mechanism [2], [4].

The welding mechanism with jet configuration is able to incorporate the influence of the main technological parameters and can somehow envisage a "working" domain for the welding parameters, for any metallic combination.

According to these assertions, it is generally accepted that the well-known phenomenon of the formation of the jet in d point is a collision, it is a fundamental condition for the process of welding through explosion. It deals with, because the formed jet represents the agent that cleans mechanically the welding areas, removes the impurities and the oxides, allows that the atoms of the two materials collide at interatomic spaces, thus resulting the welding through explosion.

As defined in the specialty language, the *p* pressure resulted by every metal in the collision point, is obtained by the following formula:

$$p = \rho \ u \ D \qquad (1)$$

where: p is the pressure of the shock at the interface between plates;

ρ - the volume body of the material;

u - the material speed of which the materials form the interface move;

D - the speed of the shock wave inside the material, this speed is approximately equal with the speed of the sound (the speed of the longitudinal waves).

Besides the dimension of the impact speed between the mobile and the fix material, the welding through explosion it is only possible if at the level of the impact and collision interface exist plastic leaks. In practice, this condition is defined that the speed of the collision point, sometimes named the welding speed, must have a lower value that the speed of the sound inside the value.

Also, so that the welding process could be obtained, the angle of dynamic collision β must excel a minimum value. This angle has very low values.

The study to obtain some layered materials through the unconventional process mentioned above, it is essential also because of the energetic independence provided by the technology, such as the energy to detonate explosive load is adequate.

To obtain the process of plating through explosion, after the construction of half-finished materials and bringing them to desirable sizes, the covers of the explosive loadings are being built, with the function to maintain the geometric sizes of the explosive loadings, under the explosive's character and its granulation. In this instance, the boxes belonging for the explosive loadings, have been made of carton.

Determined the testing conditions, the assembly of the technologic system to create the process of plating through explosion begins. Therefore, across the base plate the spacers are put.

The spacers are mechanic elements with the function to create the best distance between the plates, for the process of plating succeed.

The experimental technological system, created to realize the process of plating through explosion is shown in figure 2 [2].

To obtain a multilayer metallic structure with private characteristics, by the process of plating through explosion, has been tried to create a multi-layered metallic material, underlying aluminium alloy plates type 3105, 3 millimeters thick; between these plates is inlayed a stainless steel fibre, with the role of consolidation [2].

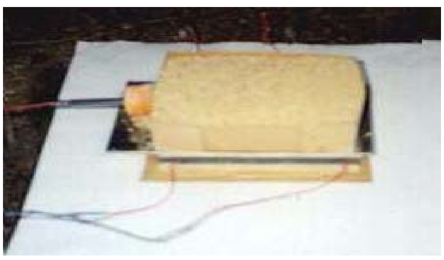

Fig. 2. Lateral angle of the experimental assembly used for the process of plating through explosion

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Studying the speed area during the assemble process, an important distinction is being observed, comparatively with the adapted mode which acknowledges the immediate transfer of the impulse from the explosive to the mobile plate, and the moving with constant speed, without causing kinetic energy loss, till the moment of impact.

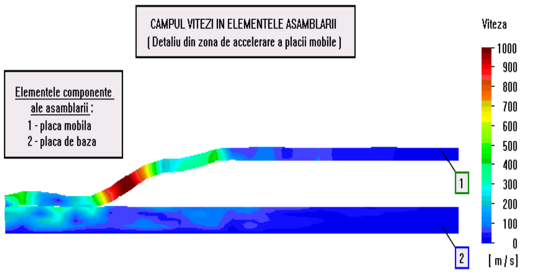

Fig. 3. Speed area during the assemble process

In figures 4 are presented the time functions of the normal speeds on a mobile plate in some control joints [2].

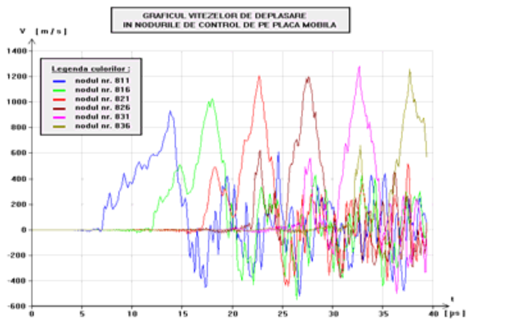

Fig. 4. Image of moving speeds in the control joints of a mobile plate.

From the calculation obtained by the simulation of the process of plating through explosion using the method of finite elements, can be observed the sequential phases of lining through explosion procedure , at time t [μs].

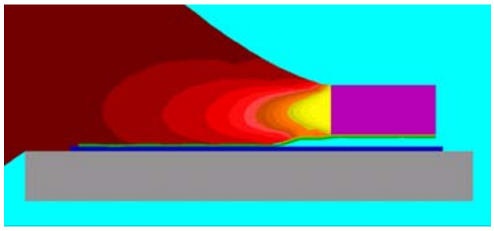

Fig. 5. Sequential phases of lining through explosion procedure , of time t [μs].

3. CONCLUSION

From the above, it can be concluded that trends in the field of research is to obtain new multi-layer materials with high mechanical properties able to satisfy the most demanding technical requirements imposed by the peak.

Types of materials submitted, including those obtained by using explosive cladding process once again underlines the fact that the layered materials are those that due to the properties they own, can meet the requirements largely [2].

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