THE INFLUENCE OF WORKING PARAMETERS ON HARDNESS OF COMPOSITE MATERIALS

Minodora Maria PASĂRE
***University "Constantin Brâncuşi"*, Tg-Jiu, ROMANI,**

ABSTRACT: A composite material can be defined as a combination of a matrix and a reinforcement, which when combined gives properties superior to the properties of the individual components. The matrix, normally a form of resin, keeps the reinforcement in the desired orientation. It protects the reinforcement from chemical and environmental attack, and it bonds the reinforcement so that applied loads can be effectively transferred.

As with all engineering materials, composites have particular strengths and weaknesses, which should be considered at the specifying stage. Composites are by no means the right material for every job.

KEY WORDS: composite material, Ni-P/SiC coatings, hardness, current density

1. INTRODUCTION

The rapid evolution of technology in fields where parts working in special conditions (construction spacecraft, engines with outstanding performance, processes that occur at high temperature and pressure or corrosive environments, etc.) resulted in the use of materials with special properties given by the nature of the material, chemical composition and microscopic structure.

Included in these kind of materials we find composites. Principle of reunion of two or more materials in order to obtain a product endowed with the appropriate characteristics for use underpins the achievement of composite materials.

The composite is an assembly of two or more macroscopically homogeneous materials with different structure and properties by combining the individual qualities of the constituents form a heterogeneous material with improved overall performance. Therefore, a composite is made up of at least two components, wherein one function of the array, the other being embedded in the first under the different forms: with the role of reinforcement with surfaces of the separation well defined, fine or colloidal dispersed [1] .

The development of science and technology have led to the design of new composite based on traditional materials and discovering new matrix and reinforcement materials, development of form and manner of distribution of reinforcements, their adaptation to technological requirements imposed on the material.

From the economic viewpoint, composites are very important; this is because the relationship quality - price - performance are not at all negligible. Because of the remarkable qualities they possess, composite materials have a number of advantages such as: making multifunctional parts which can simplify mechanisms form and allow increased performance (high mechanical properties, good resistance to a wide range of chemical, electrical properties); material adjustment to the functionality of the piece; the selection of the matrix material and the reinforcement; low costs in relation to the quality and performance of materials [2].

The performance touched by these materials are influenced mainly by the type of materials used and the manufacturing process, the last one having a decisive role in relation to the composition of starting similar, so that the same used materials can be obtained superior qualities depending on the used proces. The diversity of possible combinations of components to obtain advanced materials is high. Of particular interest are advertising those systems where it is formed continuous or interrupted solid solutions as well as those that form new combinations with any special properties.

Composite material enjoys of superior properties of traditional materials, at high temperature and ambient temperature; they present high fatigue resistance and no plastic deformation being insensitive to the usual working environments (air, oil, hydraulic fluids, paints and solvents, oil). However, it has disadvantages such as their resistance to impact and shock is less than metallic materials, exhibits the phenomenon of aging under the action of moisture and heat, and the combustion of the matrix material causes release of toxic gases and smoke.

Composite materials are successfully used in the car industry, nuclear industry, aerospace and transportation, chemicals, ceramics, metallurgy.

2. EXPERIMENTAL RESULTS

This paper presents the toughness experimental results of the composite Ni-P / SiC. The samples were obtained by means of electrolytic, bath composition is presented in [3]. The electrodeposition were prepared varying the concentration of H_3PO_3 from electrolyte in the electrolytic cell shown in Figure 1.

Electrolysis installation comprises a tank containing electrolyte and where ar immersed two electrodes the copper one having the size of 100x40 x10 (mm) and the nickel one, with the dimensions 50 x 30 x 3 (mm). The installation is provided with a magnetic stirrer to provide both heating temperature, and the stirring of the electrolyte and a thermometer for measuring the temperature. The cell is fed to a current source (I = 10A).

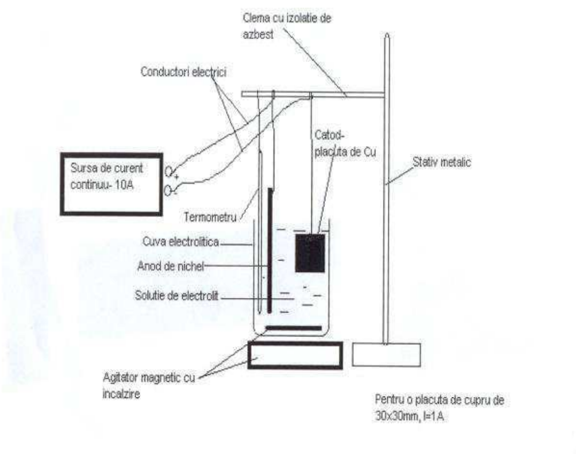

Figure 1. Electrolysis cell

The samples called S1, S2, S3 and obtained from an electrolyte containing a 5, 10, 20 g / l, with a constant content of hard particles of silicon carbide of 40g / l were prepared by varying the electric current. The dependence of applied current density and the content of the phosphorous acid in the electrolyte is given in Figure 2.

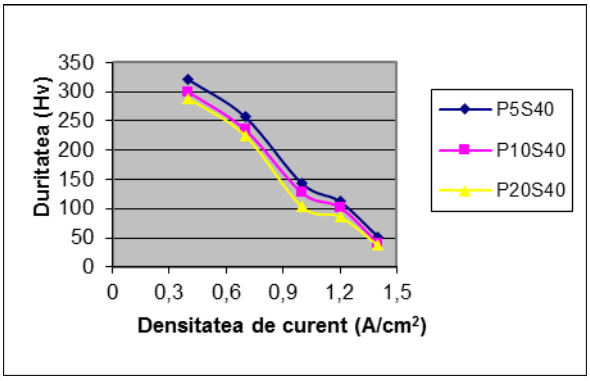

Figure 2. Change in hardness depending on the current density

It is noted that the deposition hardness varies depending on the urrent density as follows:

• Deposits hardness decreases with increasing current density.

• As the amount of phosphorous acid in the electrolyte increases, electrodeposition.

Figure 3 shows micrographs of the composite Ni-P/SiC. It is noted that the layers are deposited uniformly and adheres well to copper support.

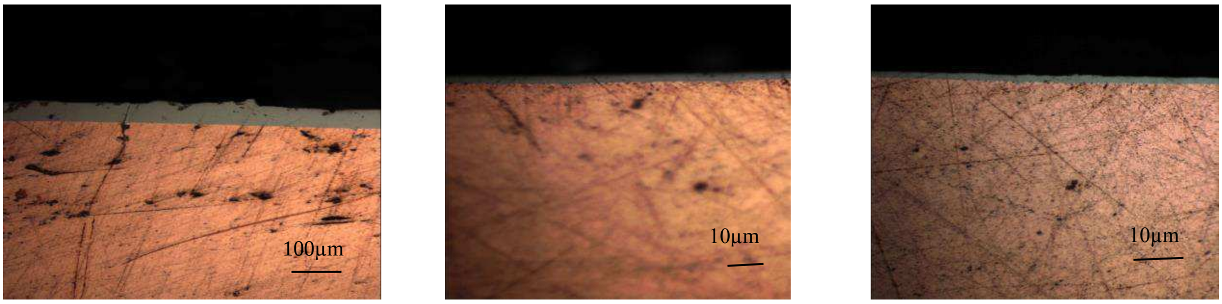

Figure 3: Micrographs of the Ni-P/SiC composite.

3. CONCLUSION

Composite materials present a particular importance in technique and they are used in complex fields (building spacecraft, engines with outstanding performance, processes that occur at high temperature and pressure or corrosive environments).

The hardness of Ni-P/ SiC layer varies both according to the amount of phosphorous acid in the electrolyte and the current density.

The hardness deposits decrease with increasing the current density.

As the amount of phosphorous acid in the electrolyte increases, the hardness decreases at higher electrodeposition current density.

The layers were made uniform and their coat adherence is good.

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