CONSIDERATIONS OF THE POSSIBILITY OF ACTIVATION SINTERING LOW ALLOY COPPER AND MAGNESE

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ABSTRACT: Problem activating the sintering process and the formation of alloy to reduce the time and sintering temperature becomes very current and the economically seems to be an extremely beneficial.

KEY WORDS: prealloyed, sintered, coper, mangan, powder steel.

1. INTRODUCTION

Following their experimental research on low alloy steels sintered copper and manganese obtained from mixtures of powders, it was found that to achieve a structural homogeneity of the material and mechanical properties comparable to those of common alloy steels are required sintering temperature and time high, 1250 ° C and 240 min .

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2. TECHNICAL REQUIREMENTS

Activated sintering improves contact and enhances transport of material between adjacent particles of dust, which can lead to obtaining superior compact and thus improve the physical and mechanical property sinterizatelor. The literature mentions several physical and chemical methods of activation sintering [2], [1], the main being:

• field sintering variables (ultrasonic, induction, etc..)
• the use of powders mechanically deformed (harden) or irradiated;
• adoption of allotropic transformation temperatures around with cyclic variation;
• sintering use a reactive atmosphere;
• the presence of low concentration of alloying elements;
• sintering in the presence of a transient liquid phase.

Activation processes in solid state sintering, applied in low alloy steels with copper and manganese are considering an alloying accelerated by increasing the diffusion coefficients in volume and density of fine structural defects. Currently many researchers are studying the possible activation sintering manganese steels calling the transient liquid phase sintering, purpose in proposing the use of additional alloying elements (boron, phosphorus, nickel) introduced in low concentrations. n the process of sintering the alloy by diffusion of an alloy of iron with 1% Mn and 1%, based on a mixture of iron powder, atomized powder of master alloys and Mn-Cu. Inteprinse experiments showed that Mn-Cu master alloys melts at 927 ° C, after which the melt is spreading very quickly on the surface of iron particles pressed.

The dissipation by melting copper and manganese actually occurs during heating up to the sintering temperature of 1100 ° C and lasts about five minutes [141].

In short pressure's heated to a temperature above the melting of Mn-Cu master alloys has LOCCI first for manganese and copper diffusion through grain boundaries of crystalline iron particles, a process followed by diflizia volume inside the crystalline grains. Figure 1 represents the typical concentration profiles of the two alloying elements. .

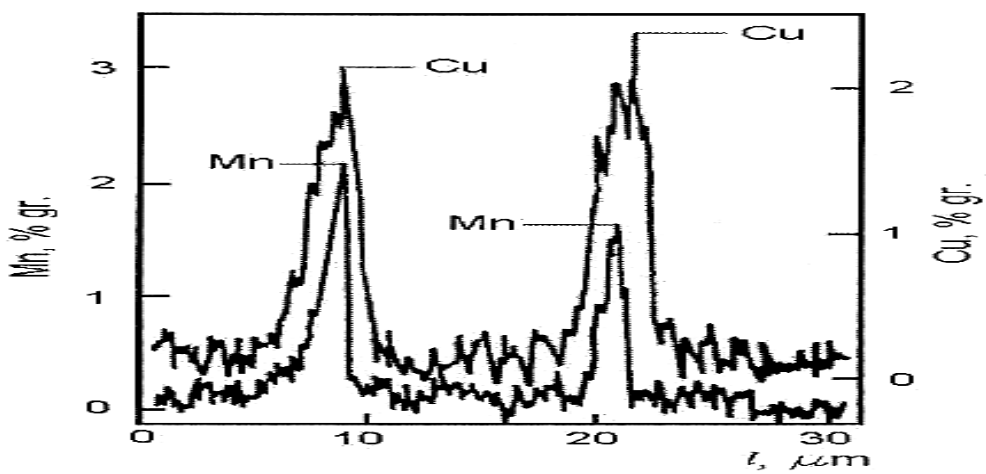

Figure 1. Manganese and copper sample profile

They were made by analyzing microspectrala Rongen, the X-ray beam passing through the boundary between two crystalline Graun. Copper and manganese concentration profiles obtained from the spectral analysis conducted on a sample of Fe-4Mn it, 5Cu-0, 45C, after heating to 1100°C. In the first stage of homogenization of the material is found that manganese and copper shows a concentration at grain boundaries of crystalline 2% (average concentratla initial mixture being 1%) and that inside the crystalline grains do not yet appear Mn and Cu.

This finding attests that dissipates immediately after melting master alloys only on grain boundaries of crystalline iron particles. Copper and manganese concentration on crystalline grain boundaries change as the wave substance to be solubilized (Mn-Cu) progressing from iron particle surface to inside. Complete homogenization kinetics is shown in Figure 2 where the variation of concentration is given in terms of duration D / a2 - diffusion length, a - crystalline grain size and temperature influence is taken into account by the diffusion coefficient D, figure2.

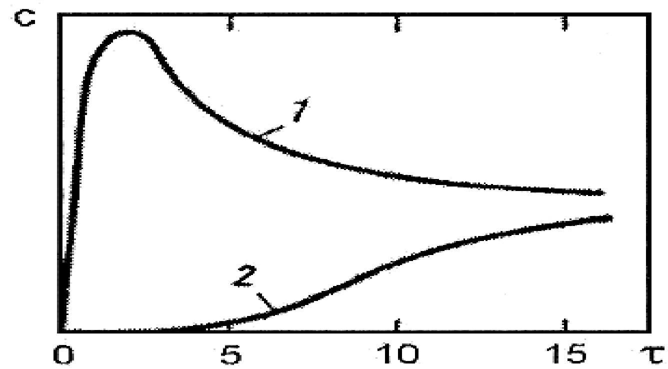

Figure 2. Kinetic curves by alloying in the solid state in the presence of transient liquid phase 1 - to limit grain crystalline; 2 - in crystalline grain center.

In conclusion, we can say that acceleration alloy formation can be achieved by placing the iron powder alloying elementebor fusible alloy as a sintering temperature below which fusion form a transient liquid phase. Accelerated penetration of alloying elements within the iron particles occurs by intergranular diffusion, completely homogeneous diffusion being related course crystalline grain volume.

In the case of low alloy steels with manganese (Fe-2mn-0, 75C), a blend of ferro-manganese and iron powder, it advantageous to create a liquid phase, for example by the addition of copper. Manganese forms solid solution with copper in a wide range of concentrations and with decreasing the liquidus curve of manganese, fig. 3.

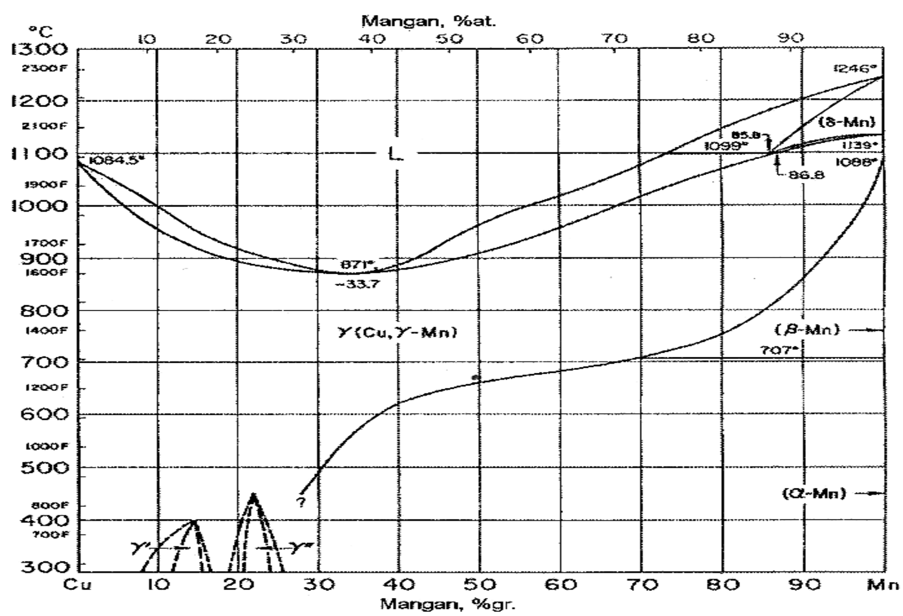

Figure 3. Diagram of Cu-Mn

Liquid phase formed by melting copper (1084.5°C) to sinter has ability to dissolve both manganese and iron, which is rise to the sintering process. Besides the favorable influence that may have on the structural homogenization manganese steels, the addition of copper allows compensation of dimensional changes that usually take place during sintering, it is done while confer favorable properties of the material.

Another way is to increase the surface activation sintering interphase. This derives from the particular low alloy steels with manganese sinter obtained from the powder mixtures of several phases present both at the beginning and throughout the sintering. Interphase surface size is primarily dependent geometric and multicomponent systems, the type and degree of mutual distribution of the phases as well as their concentration. The geometric parameters determine the kinetics of formation of the alloy.

3. CONCLUSION

Based on these considerations shown to activate amestecuribor powder sintering iron and ferro-manganese , in the research covered in this chapter were adopted two activation methods :

a. Raising the degree of dissipation of the ferro iron powder by grinding prior to a part of the ferro-manganese with iron powder.
b. Formation of a transient liquid phase sintering manganese steels I by adding copper (0-2 % wt . Cu) . Copper was added iron powder mixing powdered form complex , obtained by grinding in a ball mill shaft mixture of ferro powder and copper powder so composed as to lead to different concentrations of copper and manganese in the final mixture . Another option for introducing copper powder mixture consisted of pigmentation (wrapping) ferro powder lamellar copper powder by grinding in the mill also obtained shaft .

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