RESEARCHES REGARDING THE ROLLING OF THE SINTERIZED METALLIC POWDERS STRIPS

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ABSTRACT

This paper work is distinguishing the size modification of those two material layers gotten by the bimetallic strip rolling, joined by the sintering. The iron powders sediment was achieved on the steel strip backing. After sintering and rolling, the geometrical and technological characteristics were analyzed and correlation between the average rolling pressure, from bimetallic strip and reduction of the powder layer thickness lengthways rolling as wells correlation between hardness of the powder layer and thickness reduction after were studied.

Keywords: the reduction of the powder layer

1. Introduction

The combinate rolling or the multiple layers rolling is a procedure of rolling by which two or more metallic material layers are joined to get a set of particular characteristics:

- high strength as following of the strength increase on the flat – rolled section
- wear strength of the surface;
- chemical corrosion strength
- antifriction characteristics as following of the friction coefficient decrease.

Besides their characteristic, the multiple layers are gotten with lower costs using metallic powders, saving important expensive materials.

At present, ht rolling is the most used method to get the multiple layers processing.

The rolling assures the strength and continuously joining between layers.

H_M, h_M – initial and final thickness of the (powder) soft layer;

H_T, h_T – initial and final thickness of the steel backing.

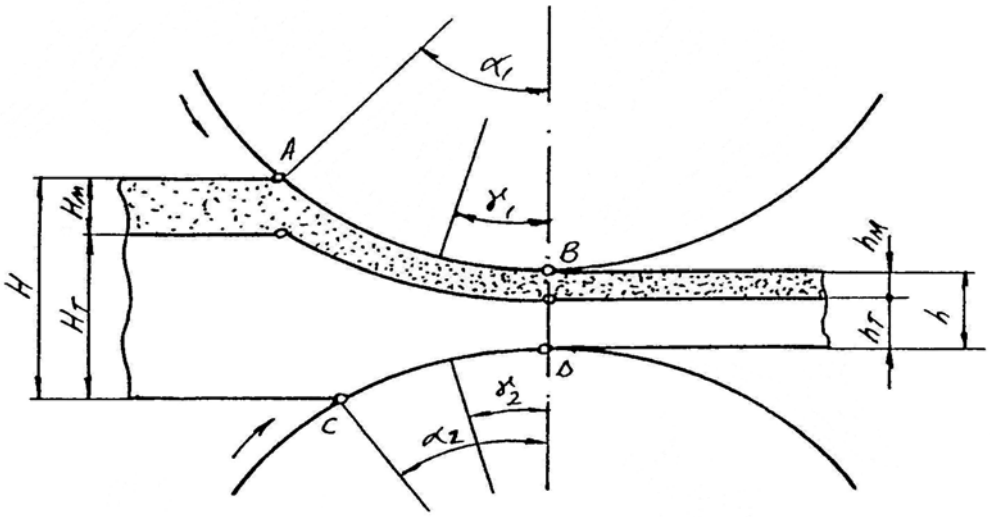


Fig.1. *Deformation zone in case of the multiple layers rolling, joined by sintering.*

2. Materials and working conditions

For experiments the iron powder grain – size of 0,063 … 0,4 mm were used and deposited on the cold rolled and pickled steel strip backing.

After settling, the thicknesses of the powder layers were: 4,31; 2,66; 2,08; 1,87 mm for a steel strip backing thickness of 1.2 mm.

After settling, each set of the test – specimen was sintered at 1200^0C in the hydrogen atmospheric in various sintering lasting – time of: 1 h, 1,5 h, 2h.

The powder settled in the various thickness layers on the steel strip backing, getting, thus, 4(four) sets of test specimens with various ratios between the thickness of the powder layer settled and the thickness of the steel backing.

After sintering, by a test –specimen measuring, a modification of the powder layer thickness – size resulted due to contraction according to fig.2.

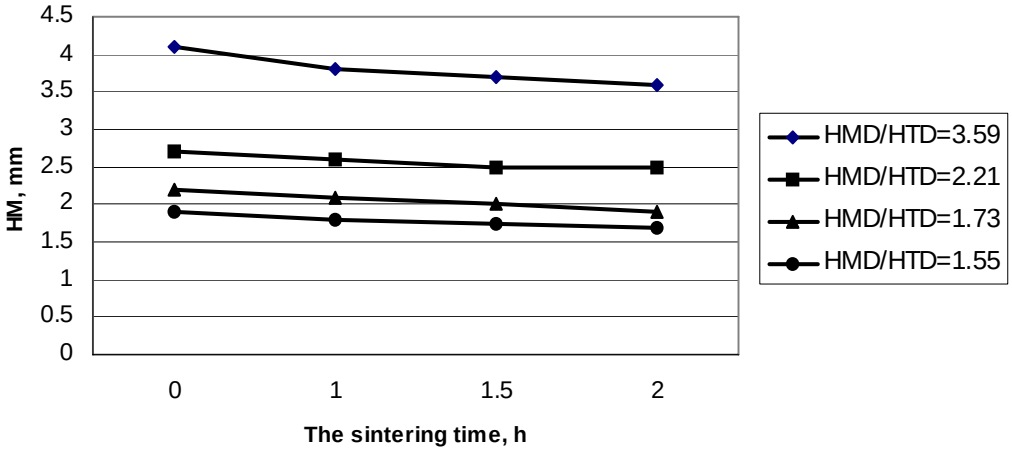


Fig.2. *The settled powder layer thickness change to the sintering time and HMD/HTD ratio*

HMD – the thickness of the powder layer settled before sintering;

HTD – the thickness of the steel backing, before sintering.

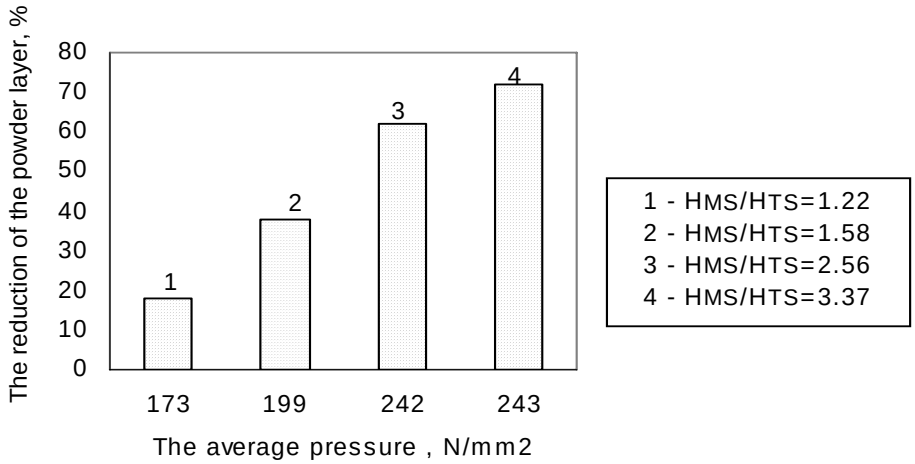
After sintering the test – specimen were rolled in three succesive passing, measuring, each time, the rolling pressure, the thickness of those two layers and Brinell Hardness of the powder layers.

3. Results and discussion

These experiments were made to watch the influence of the dimellic test – specimen rolling characteristics on the average rolling pressure and hardness.

The results are shown in fig.3.

Fig.3*. The reduction of the powder layer*



The average pressure change to the reduction of the powder layer and the ratio: HMS/HTS.

HMS – thickness of the settled layer after sintering;

HTS – thickness of the steel backing, after sintering.

An increase of the average pressure to the increase of the all test – specimen reduction is established. The application of the relative reduction on the passing up to 70% was possible on the first passing only for the test – specimen which have HMS/HTS = 3,2. The diminution of this ratio led to the reduction lowering at first passing.

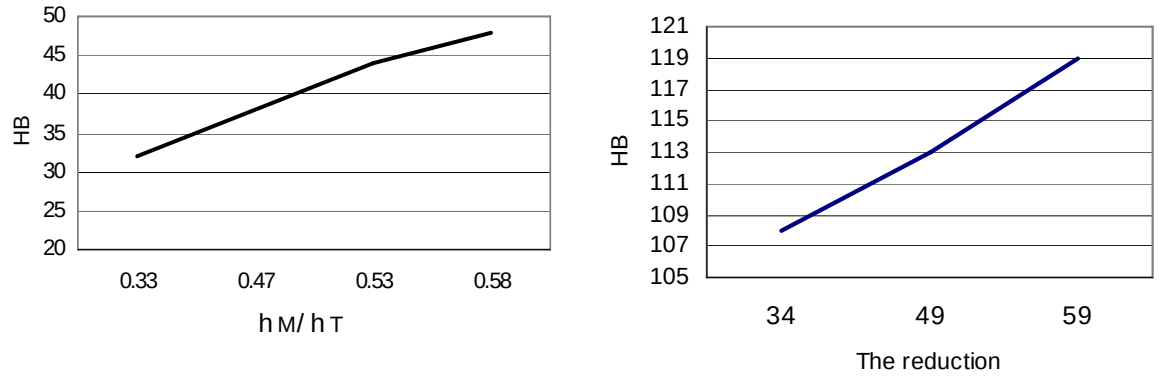


Fig.4. *Hardness change to the reduction and h_M/h_T ratio*

The application of the high reduction on the passings is possible due to powder layers compacting. As following the powder layers may suffer the reduction up to 70% while the steel backing is reduced with 1,7 … 2,6% only.

The increase of the sintering time is determining the powder layer compacting, which leads to the ratio lowering h_M/h_T (thickness ratio of those two layers after rolling).

The average pressure is recording a light diminution while the ratio h_M/h_T lowers and sintering time increases.

Finally, the change of the powder layer hardness was watched on the sintered and rolled test – specimen.

An increase of the powder layer hardness is established while the reduction degree increases.

4.Conclusions

The test – specimen sintering having various ratios of HMD/HTD led to the thickness diminution of the settled layer to the sintering time.

- the average cold rolling pressure of each passing increases to the increase of the total reduction of the powder layer;

- the hardness was measured after each rolling passing.

Generally, are increase could be remarked with the increase of the passing number and therefore an increase of the total reduction per passing as following of the layer compacting and hardening. The hardness increase is removing to the higher reductions and HMS/HTS ratios.

References

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