

Short Communication

Effect of Heat Treatments on the Mechanical Properties of a Form Tool

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During the follow-up of the cutting tools in the production workshops, we noticed that the cutting tools operate in severe conditions, for this we thought to improve their mechanical characteristics and increase their yield. Two key factors influencing these tools, namely geometry and heat treatment. In this study we chose the heat treatment, from a basic fast steel form tool, after making the milling cutter in the tool shop we proceeded to a revenue treatment to remove austenite residues. The purpose of our work is to increase the machining quota of a Z80WCV 18-04-01 high speed steel mill, for this reason our study is based on the reduction of residual austenite by incomes. cumulated after prior quenching for different austenitization temperatures (1240, 1260 and 1270 °C)

Keywords: Fluoroperovskite, GGA approach, Quasiparticles, Exciton energy, Absorption spectrum.

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1. INTRODUCTION

Precision manufacturing of cutting tools is generally better than that of the manufacture of the current mechanical parts. Especially for the shape tools: such as the form milling, not only the dimensional accuracy terminal, but also the good geometric accuracy and the good heat treatment. Thus the quality of the machined parts depends directly on this precision [1].

During the shaping of these tools the residual austenite is transformed into secondary martensite and / or bainite, which increases the ductility [2]. Thus, the steel obtained has high mechanical properties.

The machining of "hard" steels is a new process that uses cutting tools performance and particular cutting geometries. This process was developed for replace very expensive operations, such as abrasion finishing, and to protect the environment by eliminating lubrication (use of dry machining) [3]

The objective of this work is focused on the study of the influence of heat treatments on a type Z80WCV 18-04-01 basic high speed steel milling cutter with specific addition of cobalt, which we proceeded to improve. Mechanical characteristics by increasing its hardness; the carbides of chromium, tungsten and vanadium thus precipitate, following the depletion of the residual austenite by raising the hardness of the tool: this corresponds, as it were, to a multiple income [4].

Heat treatment operations are commonly carried out in furnaces with special atmospheres or under vacuum. The processes used are: curing treatments (quenching, cementation ...). Modification of the internal structures of the tools is achieved by heating to the expected temperature, maintaining the temperature in a given time and cooling at a certain speed

2. EXPERIMENTAL PROCEDURE

2.1 Material Studied

The material studied is a basic steel bar type Z80WCV 18-04-01, with specific addition of cobalt (5

and 9 %) of dimension Ø95 x 85 mm, intended for the manufacture of a milling cutter (Fig. 1). This material has the following advantages:

- high hardness 65 HRC after heat treatment;
- density 8.67·10³ Kg/m³;
- coefficient of expansion 13.0·10⁻⁶ K⁻¹ between 20 and 400 °C.

The chemical composition is shown in Table 1.

In the receiving state, the steel studied has a globular ferritol pearlitic microstructure. (See Fig. 2).

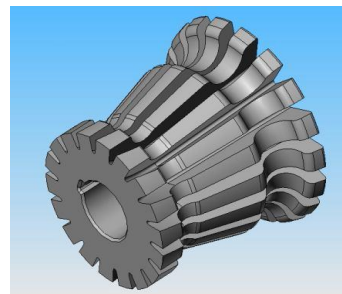


Fig. 1 – Design of the shape cutter

Table 1 – Chemical composition of steel

Z80WCV18-04-01	wt. %
C	0.82
Cr	3.76
W	18.034
Mo	0.251
V	1.05
Co	0.109

These steels were then subjected to treatment of incomes between 550 and 600 °C. after prior quenching (in a Bacl₂ salt bath) since the austenitization temperature of 1300 °C. Quenching is often followed by a tempering which triggers the transformation of the residual austenite into martensite and the hardening by precipitation of the carbides, after their dispersion, under the effect of the partial decomposition of the marten-