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Materials Science Forum
ISSN: 1662-9752, Vol. 1038, pp 93-99
doi:10.4028/www.scientific.net/MSF.1038.93

Submitted: 2021-03-17
Revised: 2021-03-21
Accepted: 2021-04-07
Online: 2021-07-13

Application of Thermo-Frictional and Chemical-Thermal Methods Treatments for Surface Strengthening of Materials

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Keywords: strengthening, steel 65G (analogue G15660 USA), steel U8A (analogue AUS8A USA), jewelry tool, thermo-friction strengthening, chemical-heat treatment, furnace boriding.

Abstract. In the article, the issues of using the methods of thermo-frictional and chemical-thermal treatments for surface strengthening of steel tools were disclosed. 65G steel and U8A steel were considered. A flat graver and a cylindrical root roller were considered to be tools in need of hardening. The nature of the jewellery work using such a tool has been described. Hardening techniques, experimental studies and macro photographs of the samples were presented in this article. A detailed metallographic analysis and measurement of the microhardness of the cross-sections of the prototypes after their strengthening using various methods was carried out. The metallographic nature of the reinforcement with the formation of surface "white layers" was shown. Comparison of the properties of the samples before and after strengthening was carried out. Conclusions about the strengthening effect of the thermo-frictional and chemical-thermal methods of strengthening were made.

Introduction

Surface strengthening of materials is of high importance in scientific and industrial applications. It is widely used both in wiffets and heavy tools. Jewellery production is a separate area of industry that requires the use of precision tools with a big set of properties. The properties to ensure a long operation life are not always enough, despite the high price of many types of tools. In this regard, new approaches to strengthen materials using thermo-frictional [1,2] or chemical-thermal [3-7] effects are currently a topical issue.

Problem Formulation

There is a wide range of jewellery tools with a flat working part. Reinforcement only for the cutting surfaces, but not the entire section of these tools was necessary. In the study of the thermo-friction hardening of such items, flat specimens in the form of a burin for cutting jewellery made of 65G (analogue G15660, USA) steel have been used. The wide variety of burins is due to their intended use for certain jobs, such as grooving, cutting metal to form fixing corners for fixing stones, trimming mirrored planes around jewellery stones, as well as engraving with the creation of patterns or inscriptions, etc. At the same time, burins for various jobs have their own individual names and can be different in shape and size. A variety of a thin burin with a rectangular cross section within the framework of this study has been considered. This burin can be used for fine cutting and engraving work (Fig. 1).

Abstract:

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