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Aleksandar Todić¹

Božidar V. Krstić², Dejan Čikara³, Tomislav Todić⁴, Ivica Čamagić⁵

MICROSTRUCTURAL CHANGES IN THE FUNCTION TO CHANGE THE CONTENTS OF VANADIUM IN STEEL FOR MOTOR VEHICLES

ABSTRACT: The aim of this study was to determine the effect of vanadium content on the microstructure of high carbon Cr-Mo steel. Vanadium content varied within the range of 0,0-3,0%V. Vanadium has great influence to the crystallization process and formed microstructure. The presence of chromium and vanadium narrows γ range and translates the E point to the lower concentrations of carbon. However, the carbon content of this steel, 1.6 wt.% C, is just over the limit of solubility, so it belongs to ledeburitic steels, but the amount of eutectic microconstituent is relatively small. With increasing of vanadium content, the eutectic point moves toward lower carbon concentrations and the temperature interval of solidification is narrowing. It has positive effects on strength and toughness.

KEYWORDS: Vanadium, Ledeburitic Steel, Toughness

INTRODUCTION

Steel X160CrMo12-1 is the air-hardening steel and belong to the group of wear resistant materials with wide application. The basic characteristic of this steel is high hardness due to its high carbon content and low impact toughness.

The objective of this research was to obtain appropriate microstructure that consists of the metallic matrix and high percentage of carbides that would allow the increase the impact toughness, and retain a high hardness of the steel. The experiments were carried out in order to improve these steel characteristics by adding of vanadium as an alloying element within the range of 0.0 – 3.0 %. Larger vanadium contents were not used, because previous papers, published by other authors, showed that the influence of this alloying element on the structure and mechanical properties is strong only in relatively small portions [1]. The as cast microstructure of this steel consists of primary austenite dendrites, partially or fully transformed, which is distributed in metallic matrix. The basic aim of this study is to get the microstructure which will provide slightly reduce the hardness and significantly increase of the impact toughness.

THE INFLUENCE OF VANADIUM

The addition of vanadium to the high carbon chromium steels, creates fine grained structure. This structure refining effect is explained by the influence of vanadium on the crystallization process. This element moves liquidus and solidus lines toward higher temperatures. In addition, presence of vanadium, even in small percentage, affects the process of solidification by narrowing of the temperature interval of crystallization. During growth of primary

¹ Faculty of Tehnical Sciences, K. Mitrovica, Serbia

² Faculty of Engineering University of Kragujevac, Kragujevac, Srbija

³ Faculty of Tehnical Sciences, K. Mitrovica, Serbia

⁴ Faculty of Tehnical Sciences, K. Mitrovica, Serbia

⁵ Faculty of Tehnical Sciences, K. Mitrovica, Serbia

