

## EXPERIMENTAL RESEARCHES ABOUT TECHNOLOGICAL AND MICROSTRUCTURAL ASPECTS IN THE CASE OF COBALT-CHROMIUM DENTAL ALLOYS

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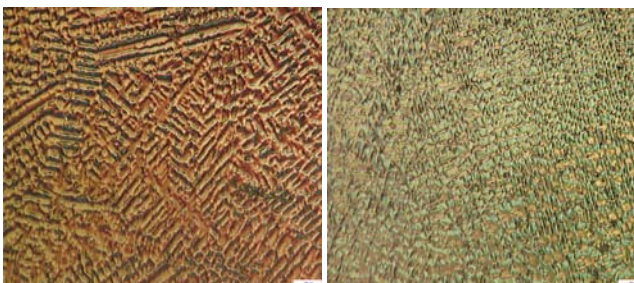
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**INTRODUCTION:** In present paper there are presented the results of microstructure investigations on samples of partial removable denture made of cobalt-chromium dental alloys and some consideration regarding the correlation between casting aspects and the microstructure aspects<sup>1</sup>.

**METHODS:** We were casting some samples from cobalt-chromium dental alloys into similar shapes. The researches have been made on cobalt-chromium alloy which are the following nominal composition: Co 63%, Cr 28%, Mo 6%, and 1.5%, Mn <1.5%, Zr<1.5%, Ti<1.5%, without: Be, Cd, Ga and Pb.

The metallographic samples taken from the casting profile have been submitted to the following tests: quantitative optical microscopy (inclusions study), qualitative (metallographic analyses) and scanning electron microscopy coupled with EDS spectrometry. In order to be prepared for optical microscopy examination, the samples were cut, polish, immerse, and dry polish and electrochemical attack with 90 ml water and 10 ml hydrochloric acid and maintaining at 5-10 V for 1-2 minutes. For finding about the nature of our inclusions, we used the scanning electron microscopy and we study the microstructure morphology of some inclusions<sup>2</sup>.

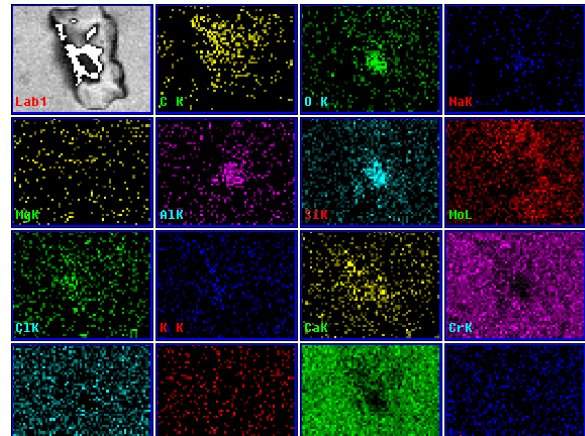
**RESULTS:** The results of the optical microscopy are presented in figure 1. According this, the alloys fit the international standards. Qualitative analysis relived that the alloy has a dendritically structure.



*Fig. 1: The optical microscopy images for the Co-Cr samples*

Over the surfaces there has been performed EDS quantitative analysis of the composition and also

analyses concerning the distribution of the elements on inclusions. The results are presented in figure 2.



*Fig. 2: The scanning electron microscopy of the inclusion and the distribution of the elements on inclusion*

We find some non-metallic inclusions, according to the distribution of the elements obtained by EDS quantitative analyses, probably from shapes.

**DISCUSSION & CONCLUSIONS:** By optical microscopy more structural aspects may be put in evidence, like the presence of carbides with discontinuous precipitation in metallic matrix or the dendritic structure, but better characterization is possible using the scanning electron microscopy. Freedom from non-metallic inclusions is a critical aspect of the castability of the cobalt-chromium dental alloys. In order to perform a better dental application by casting, the cobalt-chromium alloy must have a homogenous and dendritically structure, without inclusions, possible when we make a correlation between microstructure of the alloys and casting technology.

**REFERENCES:** <sup>1</sup> Saldivar-Garcia AJ, Lopez HF. (2005) *Microstructural effects on the wear resistance of wrought and as-cast Co-Cr-Mo-C implant alloys*, J Biomed Mater Res A. 2005 Aug 1;74(2):269-74. <sup>2</sup> Backovic N, Stamenkovic D. (1982) *The influence of different casting conditions on the microstructure of Co-Cr-Mo alloy*, Stomatol Glas Srb. May-Jul;29(3):183-93. <sup>3</sup> Morris HF. (1990) *Properties of cobalt-chromium metal ceramic alloys after heat treatment*, J Prosthet Dent. Apr;63(4):426-33.