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# European Conference on Fracture 2024

## Book of Abstracts

Edited by

Željko Božić, Željko Domazet, Robert Basan,  
Milan Vrdoljak and Marijan Andrić



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# Organization

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## **Influence of vanadium content on the microstructure, mechanical and electrochemical properties of carbides in Cr-Mo steel**

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### **Abstract**

Besides the modern non-metallic materials, which can successfully replace metallic materials in certain fields, steel materials are still largely present in technical practice. That trend will remain for many years to come. That is why there is a need to develop new types of steel, that possess better properties, in addition to the existing ones. The Cr-Mo steels, with a high vanadium content, belong to a group of the newer steels, with relatively high values of hardness and toughness. The X180CrMo12-1 steel, with varying percentages of vanadium, within the limits of 0.5-3 %, was used for the tests in this work. Vanadium, as a carbide-forming alloying element, creates a carbide network of the M7C3 type around the metal substrate, and finely dispersed carbides of the V6C5 type within the metal substrate. For the conducted research, modern equipment was used for analysis of the chemical composition, monitoring of the shape of metal grains and carbide network, tests of resistance to friction and wear, as well as for electrochemical characterization. In the conducted research, the objective was to determine the carbide composition, microstructure, and morphology and to evaluate their impact on the material's characteristics. The steel samples were experimentally examined using scanning electron microscopy with energy dispersive spectrometry (SEM-EDS) and X-ray diffractometric analysis (XRD). The carbide composition analysis has confirmed that this actually was the M7C3 carbide, as it was earlier assumed.

**Key words:** chemical composition, vanadium, carbides, microstructure, mechanical properties, electrochemical properties.