

High-cycle fatigue behaviour of Quenching and Partitioning (Q&P) treated stainless steels.

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Quenching and partitioning (Q&P) process has been widely applied to carbon steels with lean composition to improve their mechanical performance and application-related properties [1]. A few studies have shown that stainless steels are also susceptible to this heat treatment, adding a better balance of mechanical strength and elongation to their corrosion resistance. However, the research in this field is still very limited. Moreover, application-related properties of Q&P treated stainless steels have not been studied up to date. The main objective of this work is to explore the high-cycle fatigue behaviour of Q&P treated martensitic stainless steels.

Three different chemistries of stainless steels were Q&P treated and tested to determine their fatigue limits. The fatigue fracture surfaces of selected samples were analysed to identify the crack initiation and propagation mechanisms. The microstructures of the Q&P treated steels were studied using Electron Backscatter Diffraction (EBSD) technique. The effect of chemical composition and microstructure on the high cycle fatigue performance of the studies steels is discussed.

Keywords: *stainless steel, quenching and partitioning, retained austenite, mechanical properties, fatigue limit.*

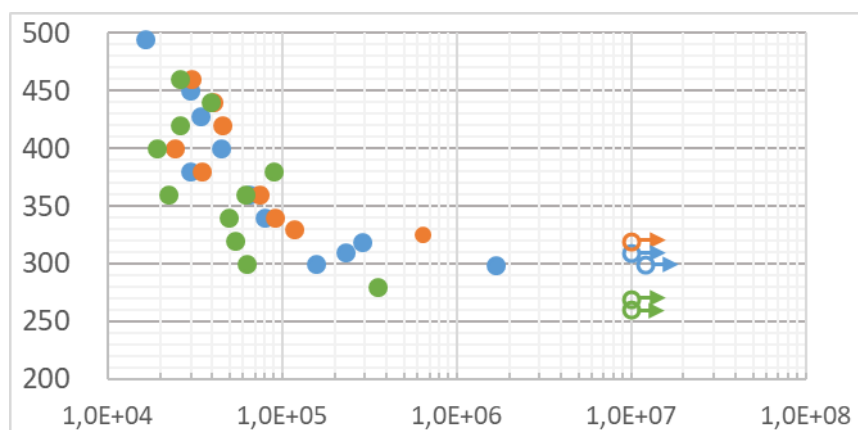


Fig.1 Wöhler curves for the three different Q&P treated steels.

References:

[1] B.C. De Cooman, J.G. Speer. Steel Res. Int. 77 (2016) 634-640