High-temperature low-cycle fatigue behavior of novel austenitic ODS steels

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Abstract

The focus of this study is to investigate the low-cycle fatigue (LCF) behavior of two newly developed austenitic 17Cr13Ni-W ODS steels. The LCF tests were performed at 650 °C with strain amplitudes ranging from 0.4 to 0.9 %. The cyclic stress response and the cyclic strain-life resistance were analyzed in detail and compared with two non-ODS austenitic stainless steels (304 and 316L(N)) and a ferritic-martensitic ODS steel based on T91. The austenitic ODS steels showed stabilized cyclic response after a slight initial cyclic hardening. Due to their high strength at elevated temperatures, the strain-life resistance became superior with decreasing total strain amplitude compared to the other materials considered.

Keywords: LCF behavior, ODS steel, austenitic steel, high-temperature application

1. Introduction

The change in German energy policy, i.e. the so called *Energiewende* requests, inter alia, a sustainable energy generation and an expansion of renewable energies [1]. Hence, steam temperature and pressure have to be raised to obtain more efficient power plants and to reduce CO_2 emissions. Pushing operation limits necessitates the application of novel materials like the recently developed

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