Analysis of phase transformation induced microtextures in ODS steels: in-situ high-temperature EBSD experiments versus crystallographic reconstructions

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Abstract

Oxide dispersion strengthened (ODS) steels are designed for advanced nuclear reactors to enhance the high-temperature characteristics of body-centered stainless steel. To understand the microstructure evolution after austenitic heat treatments, Anthony Durand (1, 2) has utilized various analysis tools but they still insufficient to explain the microstructure inheritance and the associated phase transformation mechanisms.
Nowadays, the development of compact hot stages compatible with EBSD set-up as well as the emergence of high-speed EBSD camera open a promising way to track direct microstructure evolutions induced by phase transformations (4, 5).

In this work, a heating module for in-situ EBSD observations coupled with a CMOS EBSD camera, was used to observe directly phase transformation evolutions in 10Cr and 12Cr steel with and without ODS with different initial in 10Cr and 12Cr steel with and without ODS with different initial microstrucutres (1, 2). Additionally, indirect parent-phase reconstruction has also been applied. The in-situ system was able to capture the direct transformation of ferrite/austenite during heating and the martensitic transformation during cooling of both steels with and without ODS and prove the presence of non-transformed ferrite at 1000∘C in ODS Steel. The results allow to discuss the influence of the initial microstructure on the preferential nucleation site for austenite. **We aim to give a feedback on advantages and drawbacks of in-situ HT EBSD analysis applied to ODS steels and its complement to indirect crystallographic reconstruction.**

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