

## **New Insights into Gradient Nanostructures of Ferrite in a Duplex Stainless Steels**

Sha, G.<sup>1</sup>

<sup>1</sup> Nanjing University of Science and Technology, China

<Heterogeneous materials with gradient microstructures are able to provide balance properties for critical environment applications. As a result, there are growing research interests in understanding and controlling gradient microstructures for design and developing new materials with superior properties and performance. Duplex stainless steels have important applications in chemical and nuclear power industries. They have to withstand harsh service environments such as at intermediate temperatures close to 450°C or under a certain stress. The embrittlement of the steels has a significant influence on the structural integrity of key components in service.

In this contribution, I will present our recent Atom Probe Tomography investigation about microstructural evolution of ferrite in a duplex stainless steel during a long-term thermal aging at 400°C. Our investigation provided fresh experimental evidences, and for the first time demonstrated that gradient nanostructures developed in the ferrite near the ferrite/austenite interfaces in the steel during the thermal aging. Unique segregation and partitioning behaviours of alloying elements and impurities in the steel have been revealed by our systematic APT characterizations. The mechanisms for the formation of the gradient nanostructures in the ferrite of the duplex stainless steel will be comprehensively addressed in detail. Controlling the formation of gradient nanostructure of the ferrite may provide an avenue in enhancing the fracture toughness of the steel.

Key Words: Gradient nanostructure, Stainless steels, Ferrite, Segregation, APT>

<This research work was supported by National Major Research and Development Program, China 217YFB0702204>