"Internal nitridation of Incoloy 800H: characterisation, simulation, and effects on creep behaviour"

Alice Young, PhD candidate

Internal nitridation is a form of high-temperature corrosion, believed to be a life-limiting factor in Alloy 800H reformer pigtails subject to creep deformation. Reduced pigtail lifetime can negatively affect overall plant efficiency, due to the necessity of replacement on a shorter timescale than the design lifetime might suggest. A lack of published literature on nitridation of 800H means that the effects of this phenomenon on mechanical properties, and by extension component lifetime, are apparently unknown. My primary aim is to determine if and how internal nitridation affects the creep behaviour and basic mechanical properties of Alloy 800H, through artificial nitridation and comparative physical testing. I also aim to characterise the nitrides formed in Alloy 800H and create a computer simulation of the nitridation process to further supplement the existing knowledge of this topic.

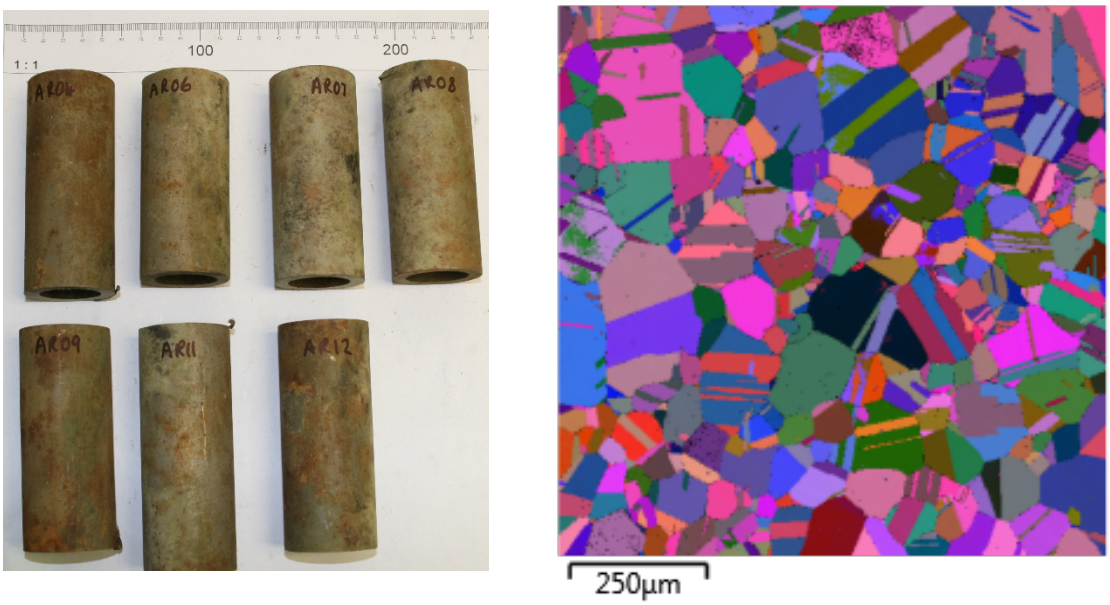

Figure 1: (Left) Alloy 800H reformer pigtail offcuts in the as-received condition, prior to artificial nitridation and testing. Samples will be aged in a nitriding atmosphere, and mechanical properties and microstructure will be compared with both air-aged and ex-service material. (Right) EBSD map of as-received material prior to nitriding, illustrating differences in crystallographic orientation between grains.

Alice joined the group in 2017 as a PhD student after obtaining her BE(Hons) in Mechanical Engineering from the University of Canterbury. Her final year group research project, sponsored by Methanex New Zealand and supervised by Dr Bishop, resulted in publication of a paper titled "Failure of Commercial Extruded Catalysts in Simple Compression and Bulk Thermal Cycling". Outside of university, she is a keen dancer, and enjoys going tramping whenever possible.

Email: alice.young@pg.canterbury.ac.nz