Loughborough University

Speaker 9

Rapid characterisation of thermally aged stainless steels for nuclear power applications

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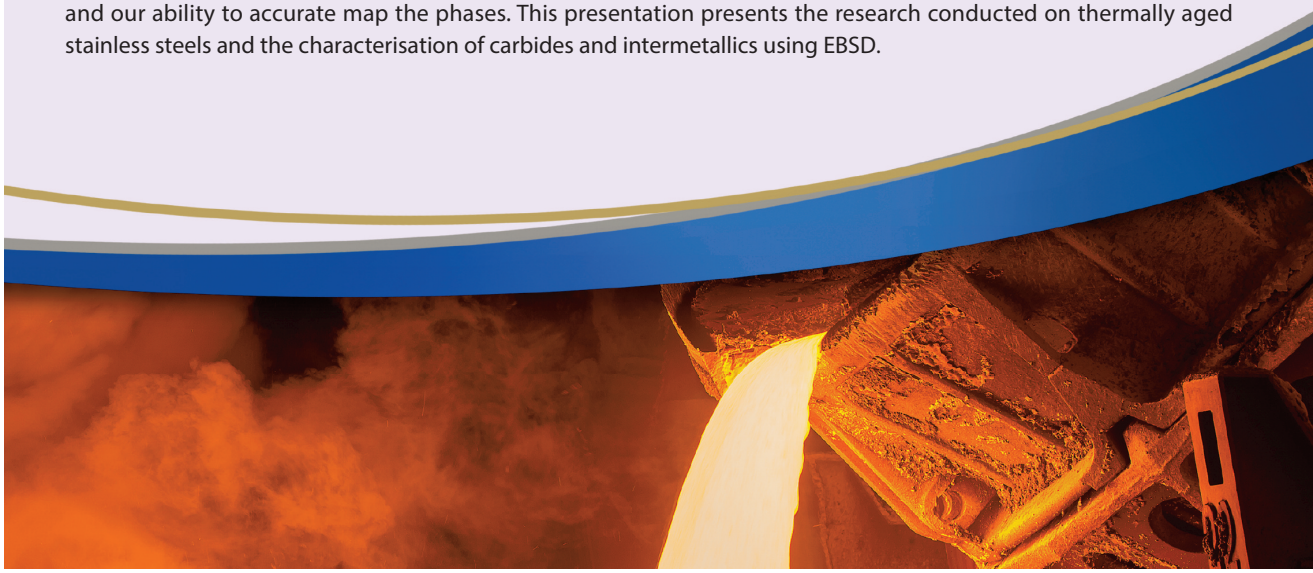
ABSTRACT:
During thermal aging in stainless steels intermetallics and carbides form. These phases may reduce the mechanical and corrosion properties of stainless steels. In some cast austenitic stainless steels, delta ferrite is present within the austenitic matrix. These regions of delta ferrite were observed to transform rapidly during thermal aging, initially forming M23C6 carbides at the interface between ferrite and austenite within ~24hrs at 750^{o}C and with sigma phase then forming within ~48hrs. The formation of these phases coincides with the formation of secondary austenite and can be described as $\delta \leftrightarrows \sigma + \gamma'$, $\delta \leftrightarrows$ M23C6 + γ'. Methods of phase identification and quantification such as Electron Backscatter Diffraction (EBSD) paired with Energy Dispersive Spectroscopy (EDS) can allow rapid assessment of these phases across large areas of material. However, when phases have similar crystal structures and are in the order of ~100nm EBSD analysis can be challenging. This presentation discusses the details of the techniques used for phase detection in these complex systems and our ability to accurate map the phases. This presentation presents the research conducted on thermally aged stainless steels and the characterisation of carbides and intermetallics using EBSD.



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