UNIVERSITY OF LEICESTER

Speaker 3

Low activation bainite steel: design and microstructure

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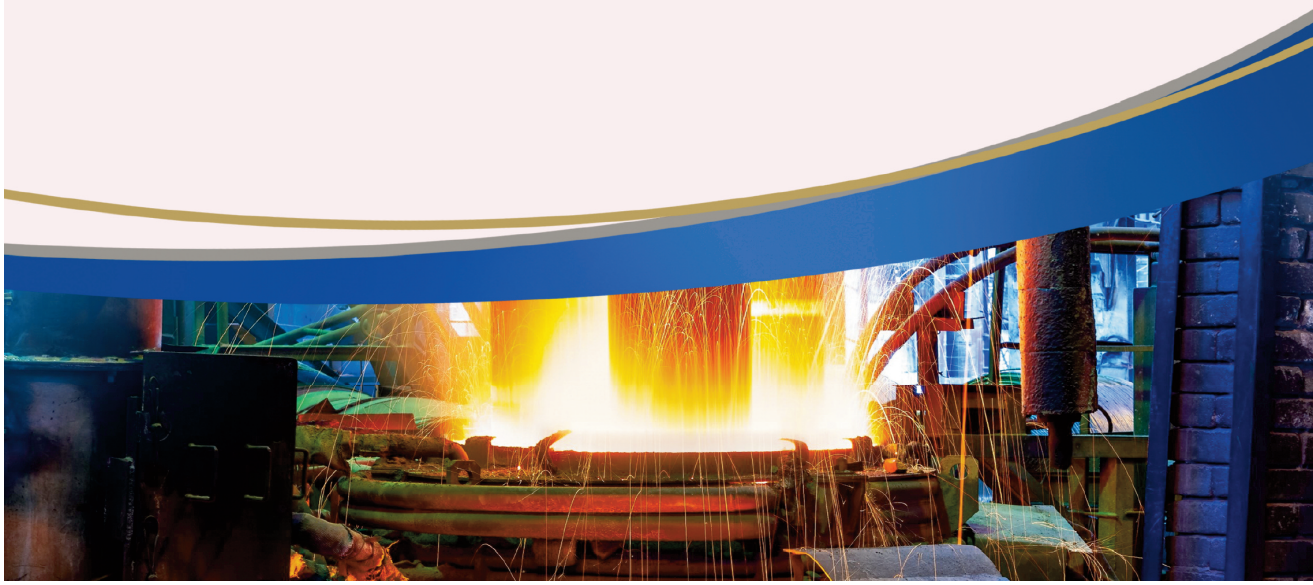
ABSTRACT:
This study introduces Low Activation Bainite Steel (LABS), a novel material designed to address the limitations of Ferritic/Martensitic steels. LABS leverages bainitic microstructures for superior high-temperature mechanical properties and radiation resistance. Machine learning models were developed to predict key properties-creep life, yield strength, tensile strength, and elongation-and integrated with multi-objective genetic algorithms to design ten optimized steel compositions. These compositions were manufactured and validated through dilatometry, thermodynamic modeling (JMatPro, Thermo-Calc), and advanced microstructural characterization (SEM, TEM, EBSD, XRD). Tailored heat treatment schedules were developed, and mechanical testing is underway to evaluate performance. This pioneering work establishes a comprehensive framework for LABS development, offering transformative potential for power generation and advanced energy systems requiring exceptional high-temperature and radiation-resistant materials.



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