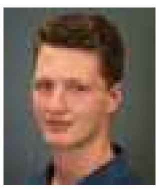
Advancing Induction Heating Technology for Sustainable Processing and Property Enhancement for Advanced High-Strength Sheet Steels










This project aims to advance the technology development related to the replacement of combustion heat for steel manufacturing with electrified induction heating technology for sustainable steel processing. The current investigation involves a comparative study of the effects of simulated induction annealing versus conventional continuous annealing on the microstructure development and mechanical performance of third-generation advanced high-strength sheet steels. The project outcome is envisioned to help the industry, especially steel suppliers to automotive original equipment manufacturers, realize process energy and emission savings while maintaining or improving product performance, thereby facilitating the decarbonization of process heat and transitioning to electrified and low-carbon fuel energy sources in the steel industry.

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Project Goals

The objectives of this work are (1) to explore the feasibility of induction heating to replace conventional gas-fired furnaces used for continuous annealing while enhancing the performance of advanced high-strength sheet steels through application of fundamental material engineering principles and (2) to increase the students' interest in advanced steel physical metallurgy and sustainable manufacturing technologies through research, education, and industrial engagement.

Project Details

Background and Significance

One important pathway to the decarbonization of the steel industry is the electrification of reheating furnaces including continuous annealing line reheat/soaking sections, where the majority of the energy used for process heating originates from fossil fuels (i.e., via combustion of natural gas).[1] Notably, induction heating is a relatively well-developed technology for various heat treatments including surface hardening and tempering processes, but current induction heating technologies have not been established for larger-scale, continuous thermal or thermomechanical processing that requires relatively high-temperature heating. In contrast to conventional gas-fired furnaces, short heating and soaking times can be achieved through induction heating, which would benefit energy and emission savings as well as property enhancement for some microstructures.[2] However, shorter induction processing may also result in problematic thermal gradients during heating and