Inter-American Materials Collaboration: New Sheet Steels Developed Through Carbon Partitioning

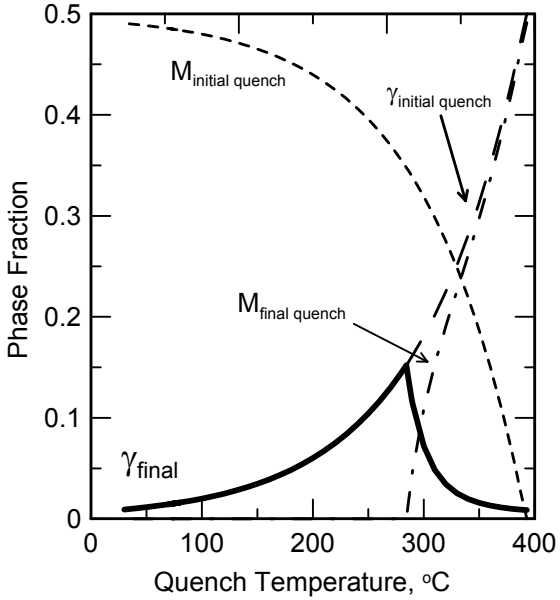
John Speer and David Matlock, Colorado School of Mines,

DMR-0303510

Steels are a broad class of iron-based materials. They contribute to society in many ways through applications in construction, transportation, energy, etc., and the science and technology related to steel products is constantly evolving.

A new theory has recently been developed which hypothesizes new microstructures, based on a new heat treatment process called "quenching and partitioning" or Q&P. This process is being explored by an international research team of metallurgists and materials scientists.

Austenite Formation and Decomposition, ISS/TMS (2003), in press.



Predicted microstructure for an experimental steel, after application of a quenching and partitioning treatment to produce mixtures of austenite (γ) and martensite (M). An interesting dependence of γ_{final} on the quenching temperature is theorized.

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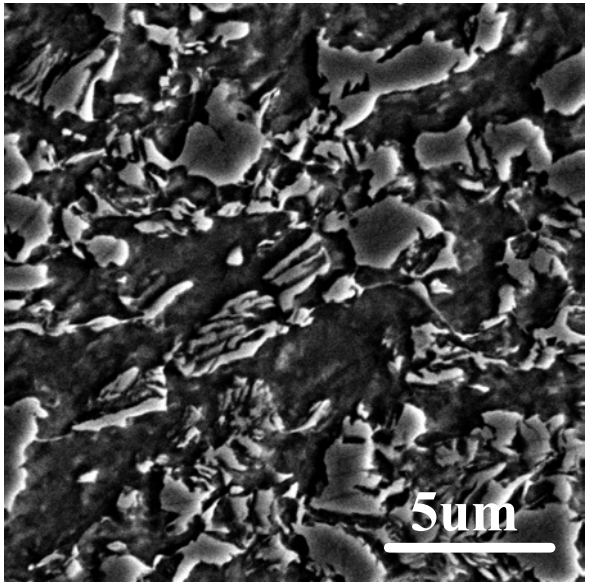
Education:

The project began in August 2003, and currently involves Amy Streicher, a Ph.D. student at Colorado School of Mines, along with Florian Gerdemann, a visiting Dipl. Eng. student from Aachen University in Germany, and Colorado School of Mines undergraduate student Scott Unger.

Example microstructure of a steel treated using the Q&P process, as viewed in the scanning electron microscope. The various features control the properties of the steel, and include different morphologies of ferrite, martensite and austenite.



Collaboration:

Formal collaboration currently involves Pontificia Universidade Catolica de Rio de Janeiro in Brazil, whose activity is sponsored by CNPq in Brazil, and informal discussions are underway with academics in other countries. Industrial collaborators include members of the Advanced Steel Processing and Products Research Center, and NSF Industry/University Research Center at Colorado School of Mines.