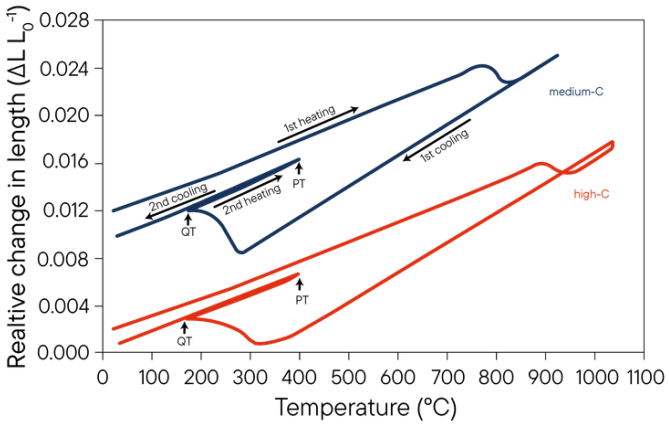
# Optimizing Quenching & Partitioning Heat Treatments

DIL L78 RITA Analysis of Phase Transformations in Advanced High-Strength Steels

Quenching and Partitioning (Q&P) heat treatments are widely used to optimize the balance between strength, toughness and wear resistance in advanced steels. Accurate characterization of phase transformations is essential for designing efficient heat treatment cycles. In this study, dilatometric measurements were performed using a LINSEIS DIL L78 RITA to investigate the dimensional changes occurring during a complete Q&P cycle. The results provide valuable insight into phase transformation behavior and microstructural evolution.

## Measurement Setup

- Instrument: LINSEIS DIL L78 RITA
- Material: Medium- and High-Carbon Steels
- Maximum Temperature: $Ac_3$ + 50 °C
- Atmosphere: Argon
- Measurement: Dilatometric Q&P Cycle
- Application: Heat Treatment Development




The dilatometric analysis reveals distinct dimensional changes throughout the Quenching & Partitioning cycle.
Key observations include:

- Austenite formation during heating
- Martensite formation during quenching
- Expansion during partitioning
- Stable dimensional behavior after final cooling

The results demonstrate the capability of dilatometry to monitor complex phase transformations during advanced heat treatment processes.

## Interpretation

The observed behavior can be attributed to:

- Austenite formation during heating
- Carbon partitioning into retained austenite
- Martensitic transformation during quenching
- Stabilization of retained austenite

This results in:

- Optimized heat treatment cycles
- Improved phase transformation control
- Enhanced microstructure development

## Industrial Relevance

Dilatometric measurements with the LINSEIS DIL L78 RITA support:

- Quenching & Partitioning development
- Heat treatment optimization
- Advanced high-strength steels
- Phase transformation analysis
- Automotive components
- Tool and wear-resistant steels

## Conclusion

The LINSEIS DIL L78 RITA enables precise characterization of dimensional changes during complex Quenching & Partitioning heat treatments. Understanding phase transformations and carbon partitioning is essential for optimizing microstructure and mechanical performance in advanced steels. These insights support the development of next-generation high-strength and wear-resistant materials.


Source:
Del Molino, E., Arribas, M., Pérez, I., Valdavida, F., González, J. J.
Microstructure and Wear Resistance in Medium and High C Steels Treated by Quenching & Partitioning.
Steel Research International, 2023.
Adapted from dilatometric Quenching & Partitioning measurements performed using a LINSEIS DIL L78 RITA.