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Research interests:

Quenching and partitioning

Solid-solid phase transformations

Diffusion of alloying elements

Phase field modelling

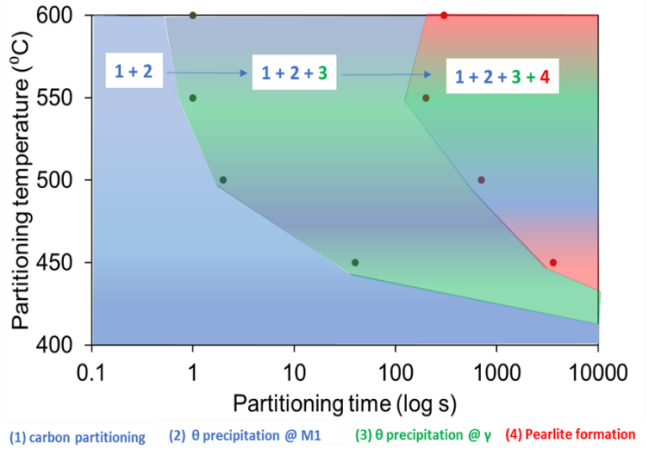
Partitioning of substitutional alloying elements in Q&P steels

RECENT RESEARCH ACTIVITIES:

Quenching & Partitioning (Q&P) has been considered as one of the promising heat treatment techniques to produce 3rd generation AHSS. These steels have been gaining interest in the automotive sector as they deliver high strength with a combination of high ductility. My research aims to study the partitioning kinetics of substitutional alloying elements and its effect on the austenite stabilization. For this purpose both experimental and modelling (Phase field) techniques are being used.

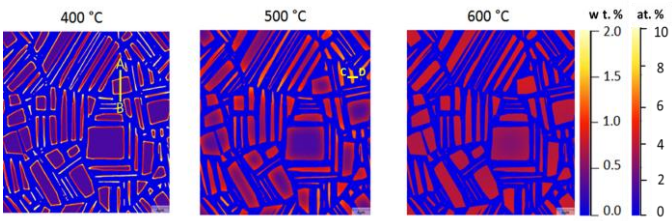
Microstructural evolution during high-temperature partitioning of a medium-Mn Q&P steels

In order to study the microstructural evolution during the high partitioning temperatures characterization techniques like dilatometry, magnetometer, XRD and SEM are used. It was observed that there are several overlapping phenomenon (carbide precipitation and pearlite formation) that are activated at high partitioning temperatures which counteracts the stabilizing effect of C and Mn partitioning.



Partitioning temperature time (PTT) diagram showing various phenomenon happening at different partitioning conditions

Partitioning kinetics of alloying elements during Q&P treatments using phase field modelling



Diffusion profiles of C after an isothermal holding for 300s at 400 °C, 500 °C and 600°C in an FeC system.

Phase field modelling simulations carried out in a simple model showed that

- The dimension and the shape of austenite present at the quenching temperature affect the resulting carbon distribution developed at different times within these grains.
- Within a FeCMnSi system, the addition of Si lead to a delay in Mn diffusion. A local enrichment of silicon occurs into the martensite (α^{I}) side of the α^{I}/γ interface, indicating the chances of carbide formation in the austenite region.

OTHER ACHIEVEMENTS:

- EUROMAT'17, Thessaloniki - Greece, Sept' 2017– Oral presentation:
  Microstructural evolution during high-temperature partitioning of a medium-Mn Q&P steel.

- THERMEC'18, Paris - France, July 2018 –
  Accepted for oral presentation:
  Partitioning kinetics of alloying elements in a medium Mn steel during Q&P treatments using phase field modelling.