

# STRESS-CORROSION CRACKING IN ACIDIC AQUEOUS ENVIRONMENT

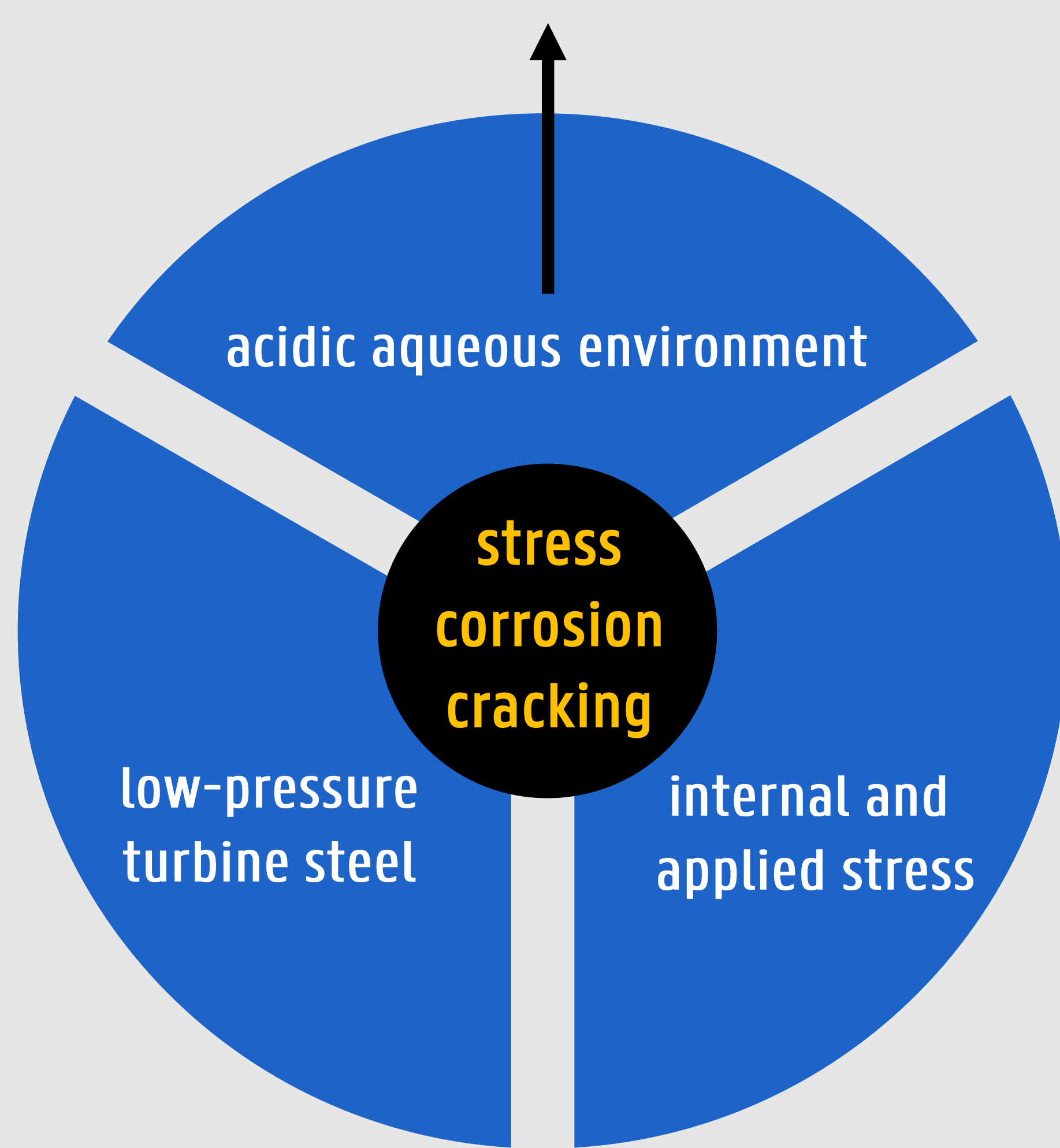
T. De Seranno, E. Lambrechts, T. Depover, A. Verliefde, K. Verbeken

## Introduction

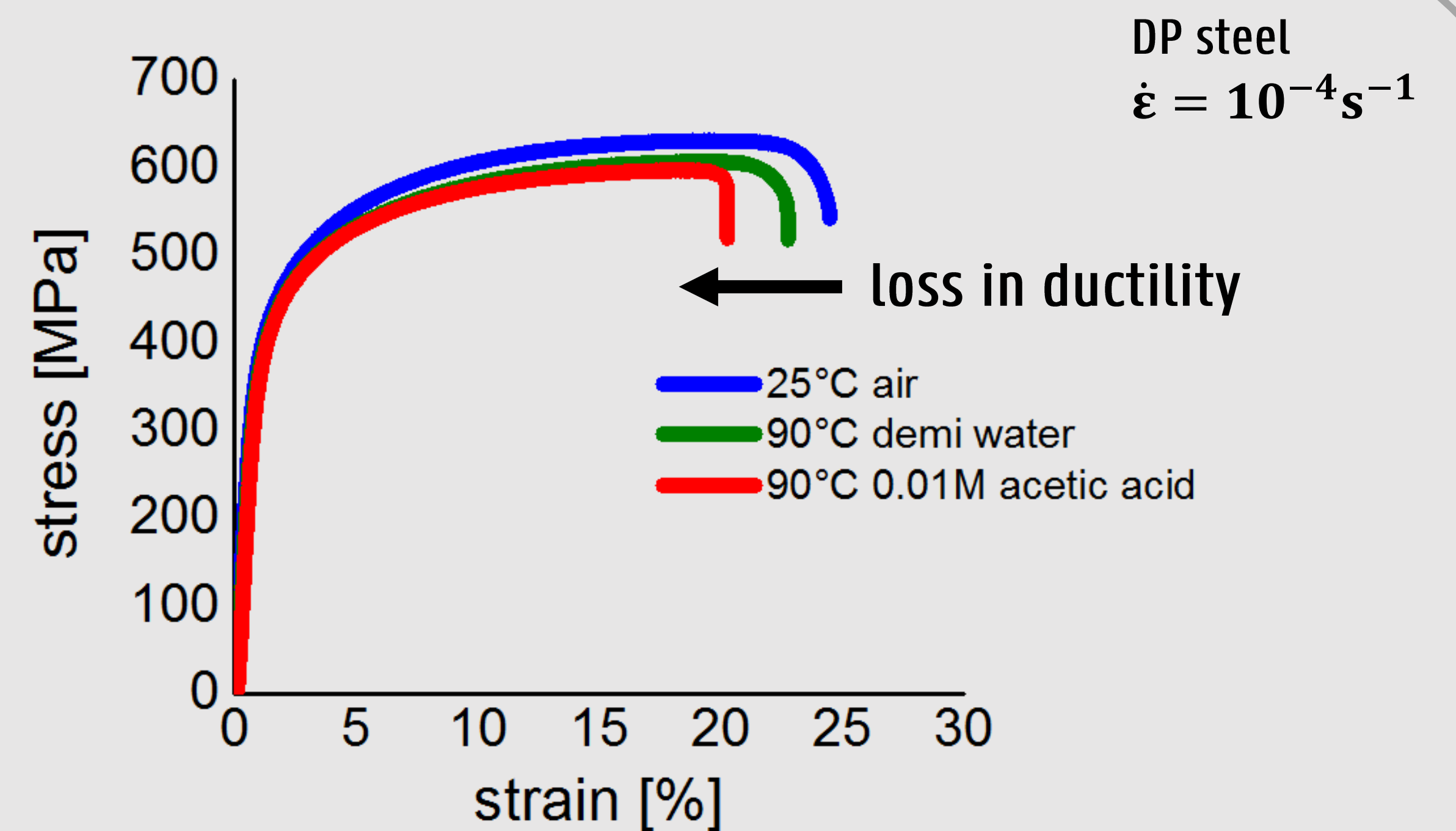
Acidic stress-corrosion cracking of low-pressure steam turbine steels can be induced by the presence of organic acids in the first condensate of steam/water cycles. In this work, the mechanism behind the mechanical degradation caused by acidic stress-corrosion cracking was investigated.

## Corrosion phenomenon

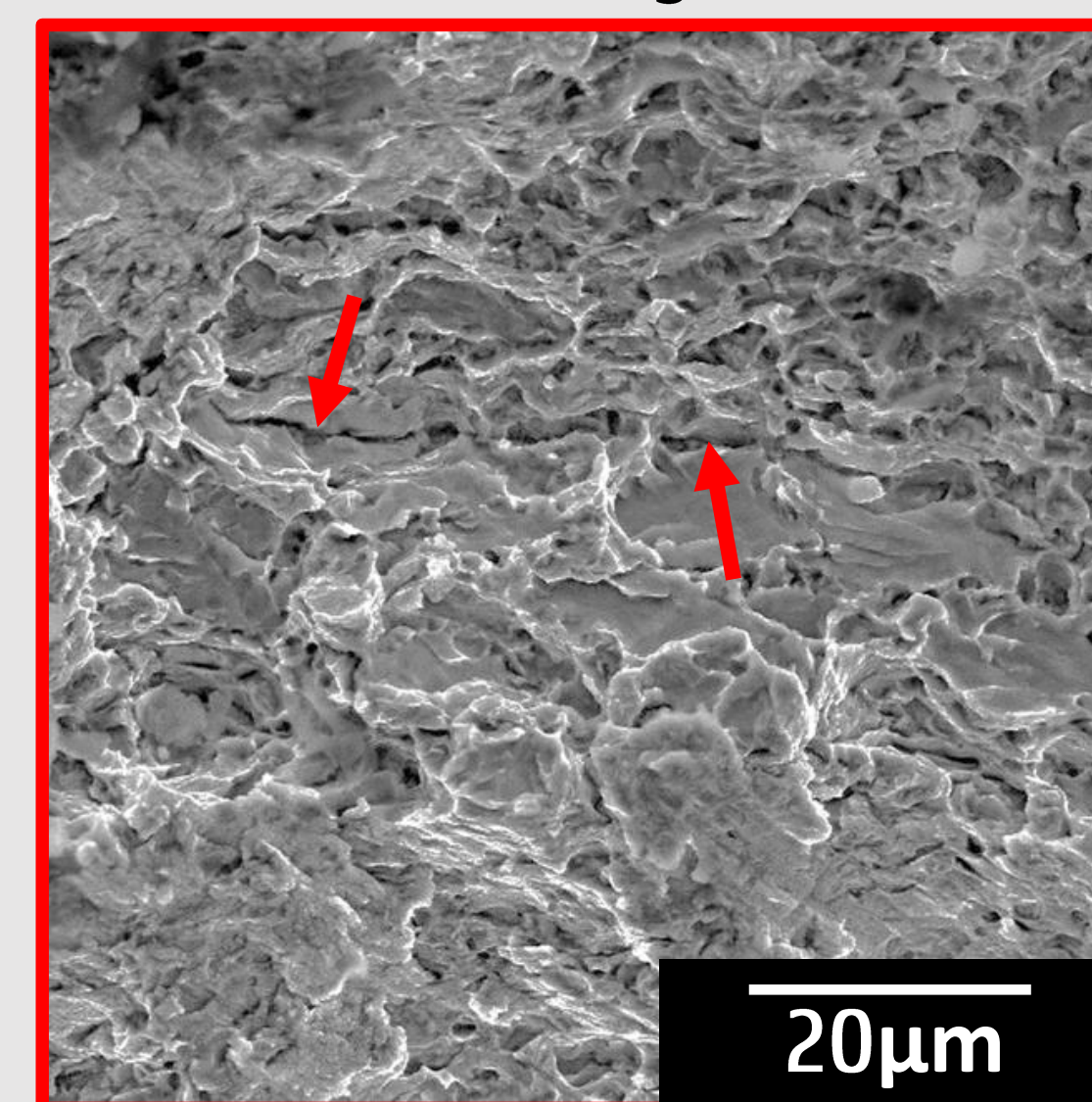
organic acids  
due to hydrothermolysis of organic contaminants



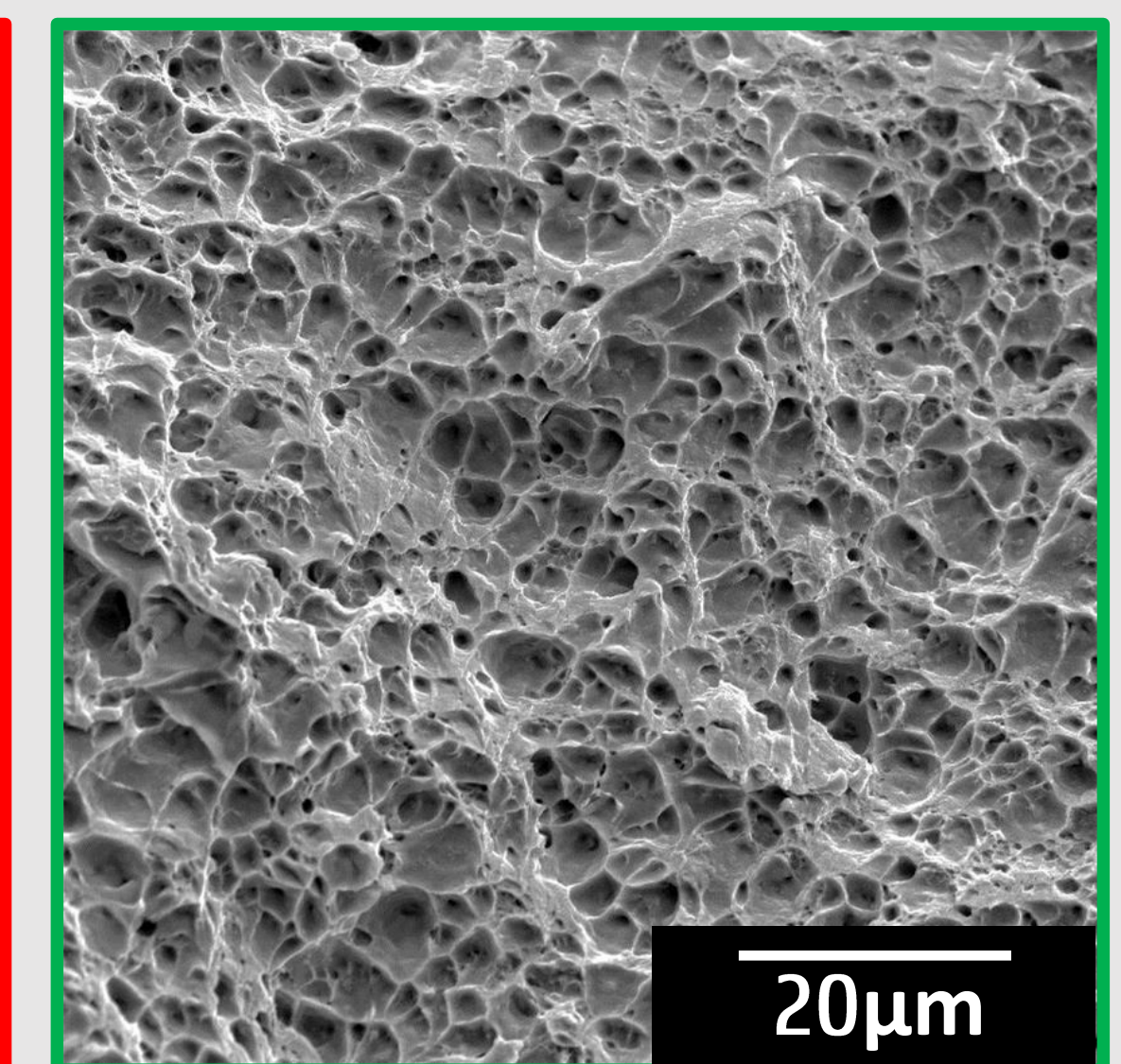
## Mechanical degradation



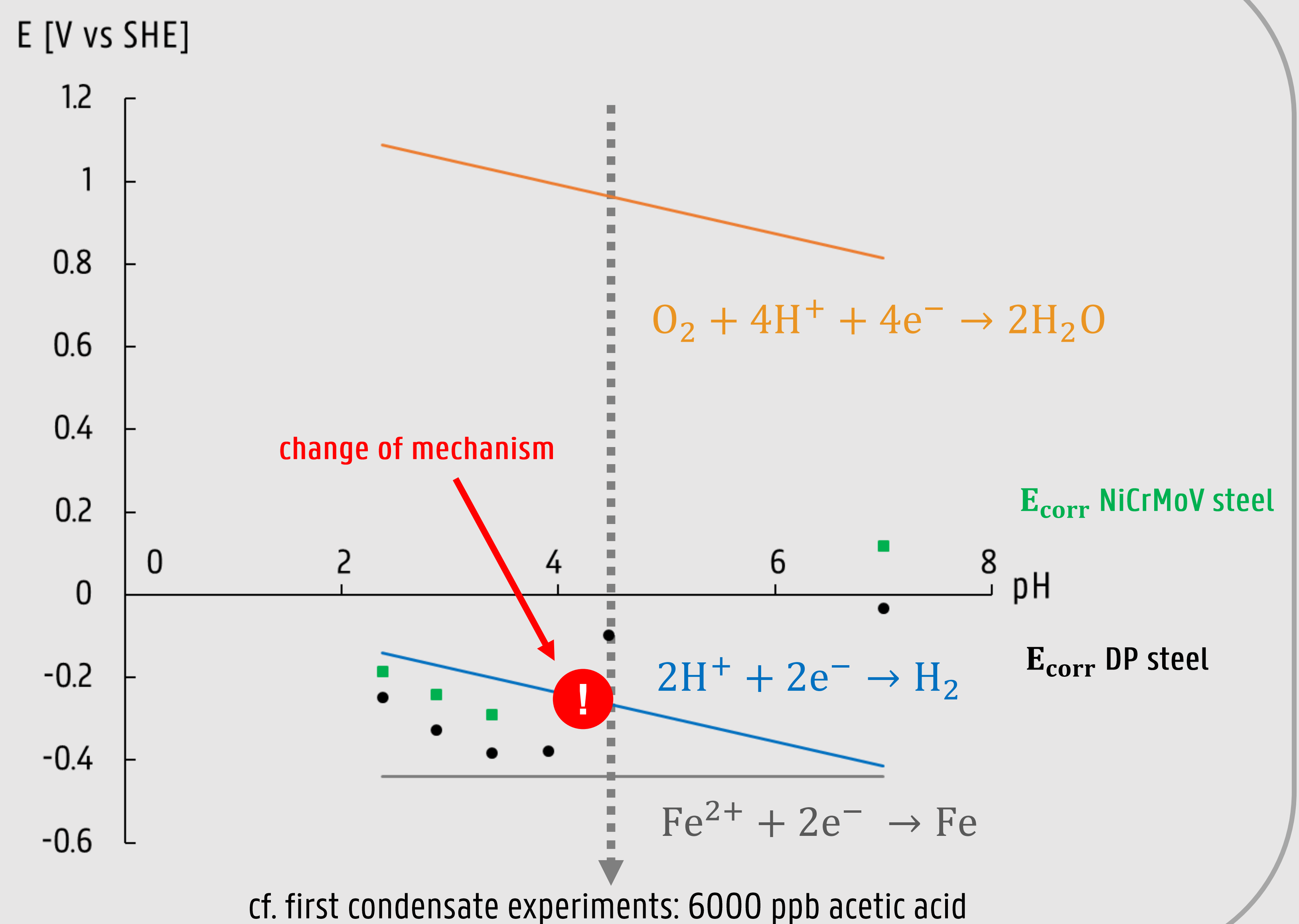
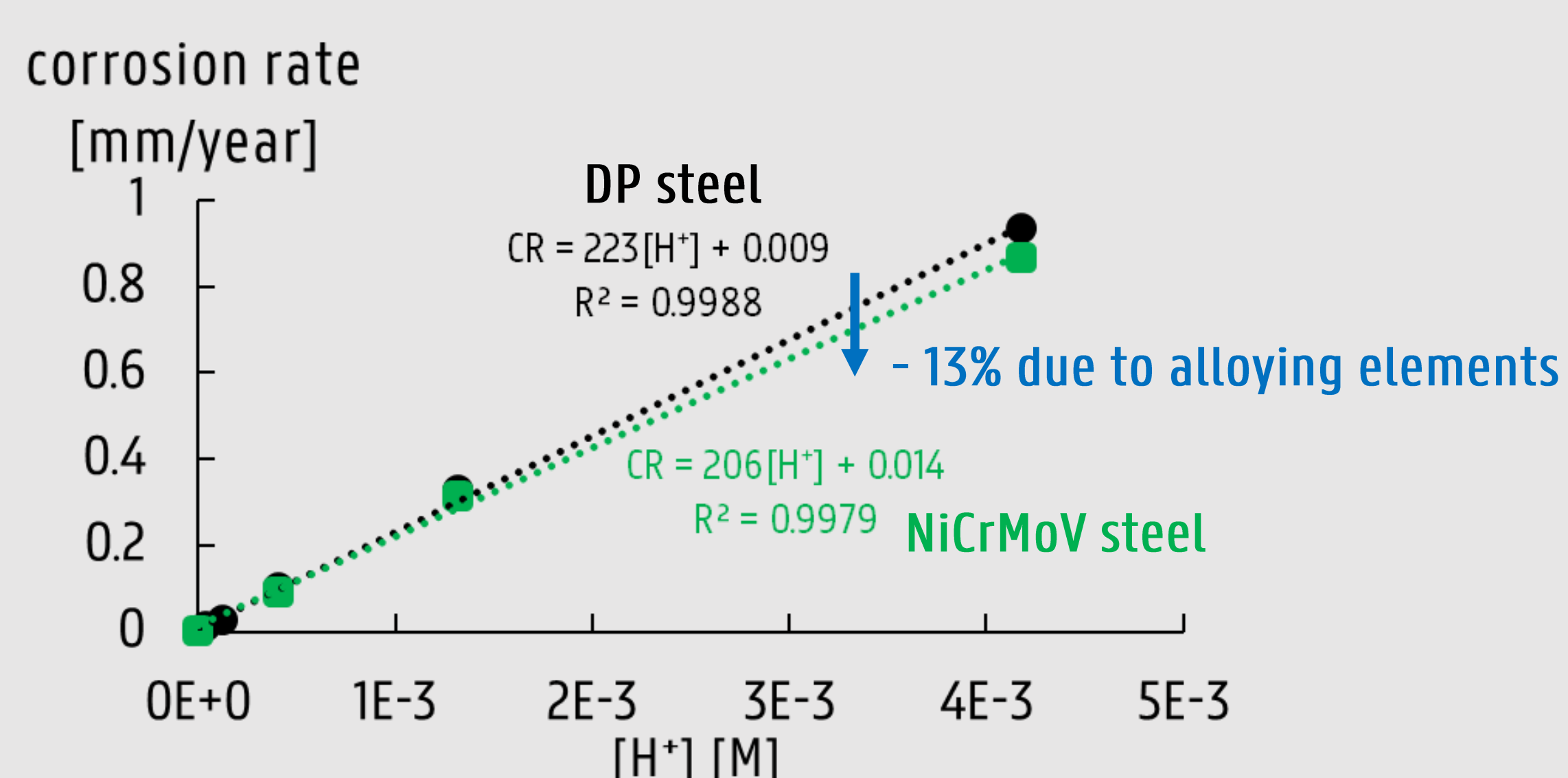
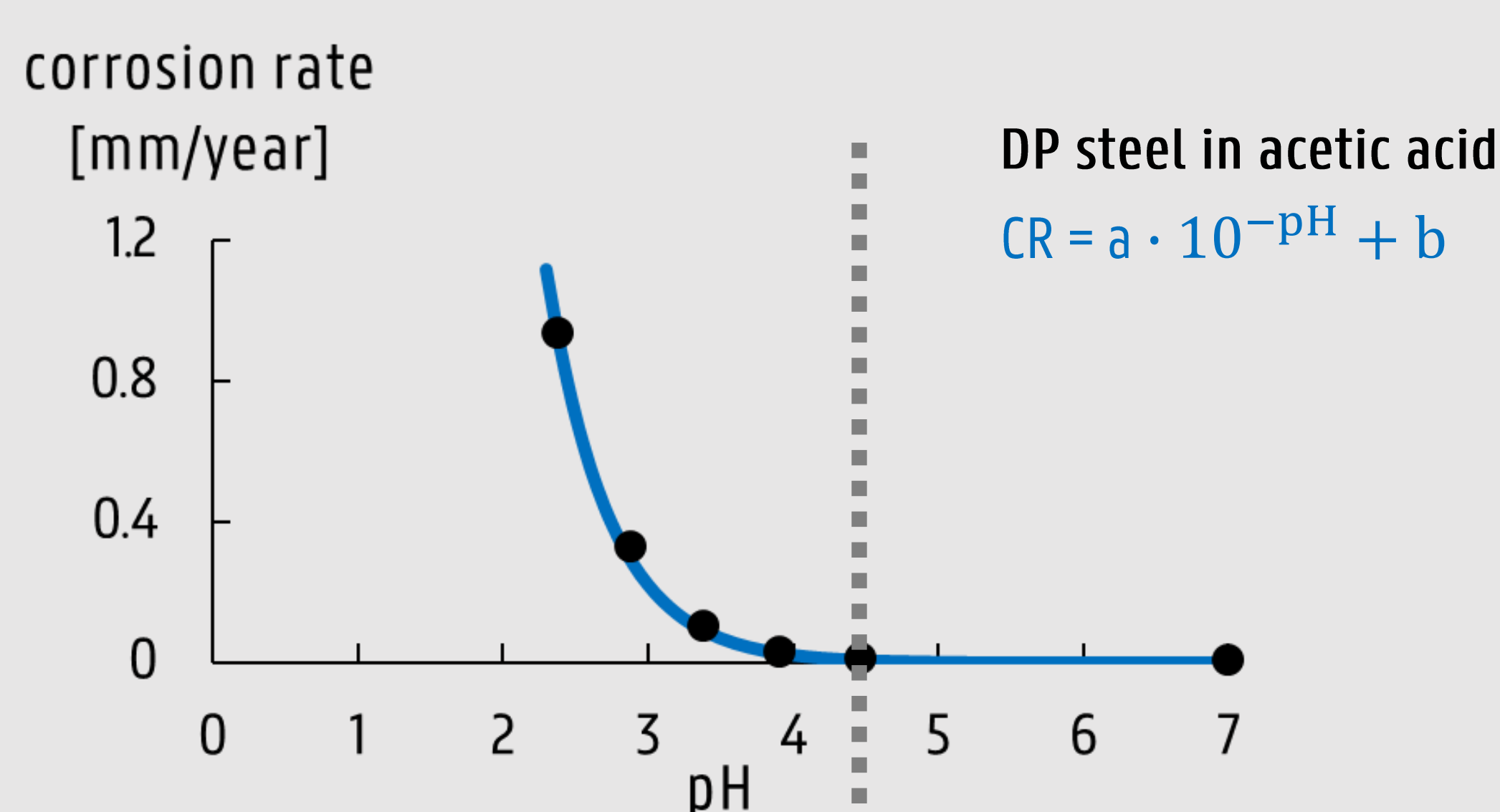
Quasi-cleavage fracture



Ductile fracture



## Mechanism



## Conclusions

- A loss in ductility was observed when acetic acid was added in the aqueous environment of the steel, causing (H-induced) quasi-cleavage fracture
- A linear relationship between the corrosion rate and the hydrogen proton concentration was determined, which was affected by the alloying content
- A change in corrosion mechanism was indicated by corrosion potential measurements, i.e. the activation of hydrogen reduction when lowering the pH
- Appropriate water purification regarding organic acids is needed to limit the corrosion rate, as well as to prevent H reactions, inducing H-damage