



CEMMPRE
CENTRE FOR MECHANICAL ENGINEERING, MATERIALS AND PROCESSES



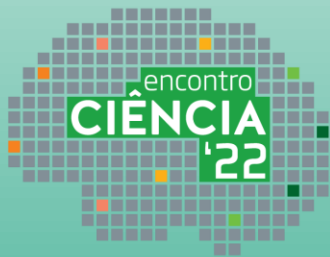
UNIVERSIDADE D
COIMBRA

Falha por fadiga em materiais metálicos

Fatigue failure in metallic materials

Edmundo Sérgio

(replacing Fernando Antunes)



ENCONTRO
COM A CIÊNCIA
E TECNOLOGIA
EM PORTUGAL

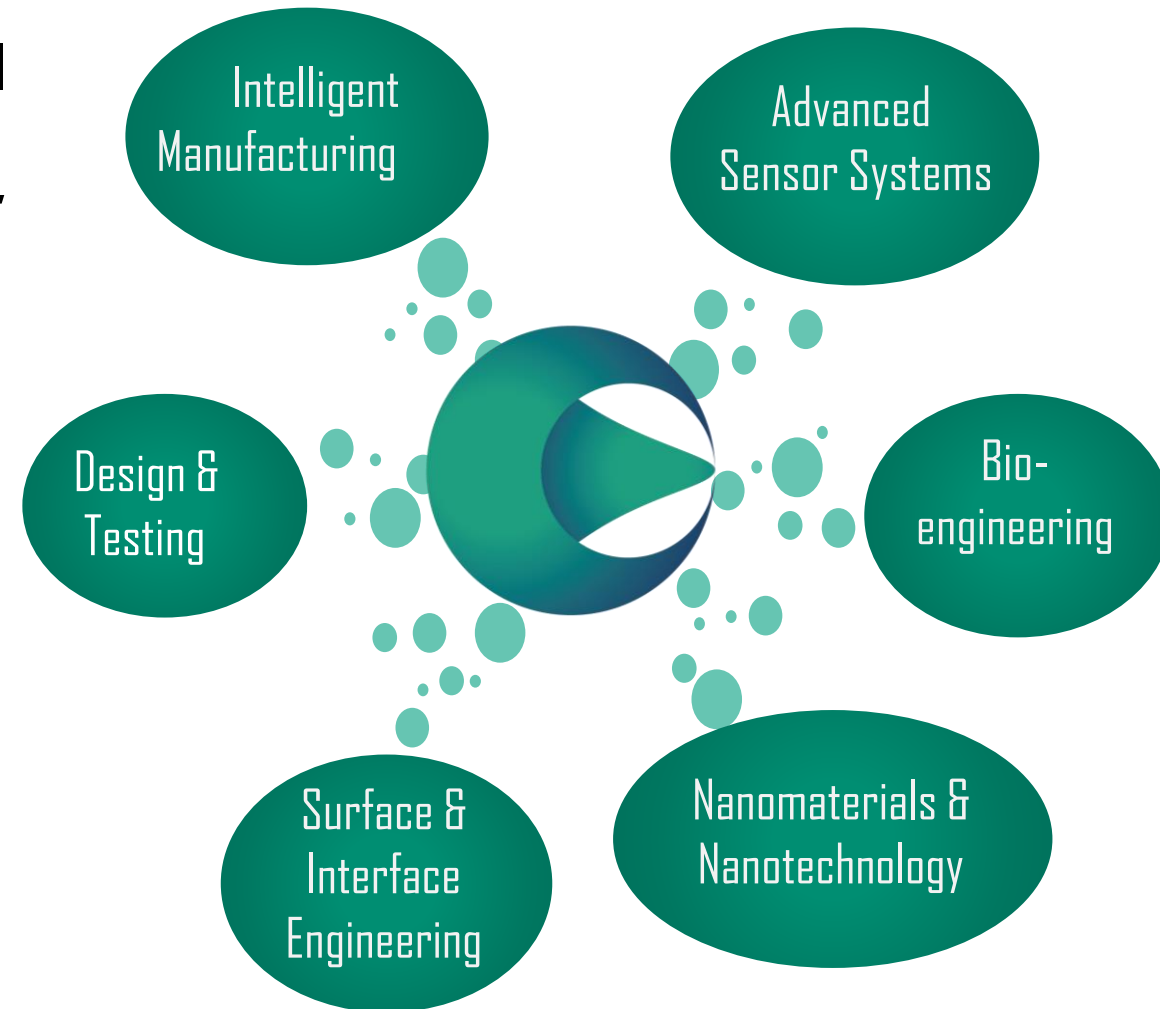
16 a 18 MAIO 2022
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17 May 2022



The CEMMPRE (**Centre for Mechanical Engineering, Materials and Processes**) is an interdisciplinary R&D Unit working on fundamental and applied research in **Mechanical and Materials Engineering**, and other related areas.

Management Institution: Universidade de Coimbra





Fatigue failure in metallic materials

Design against fatigue is fundamental
in all structures submitted to cyclic loads
(particularly in critical components)

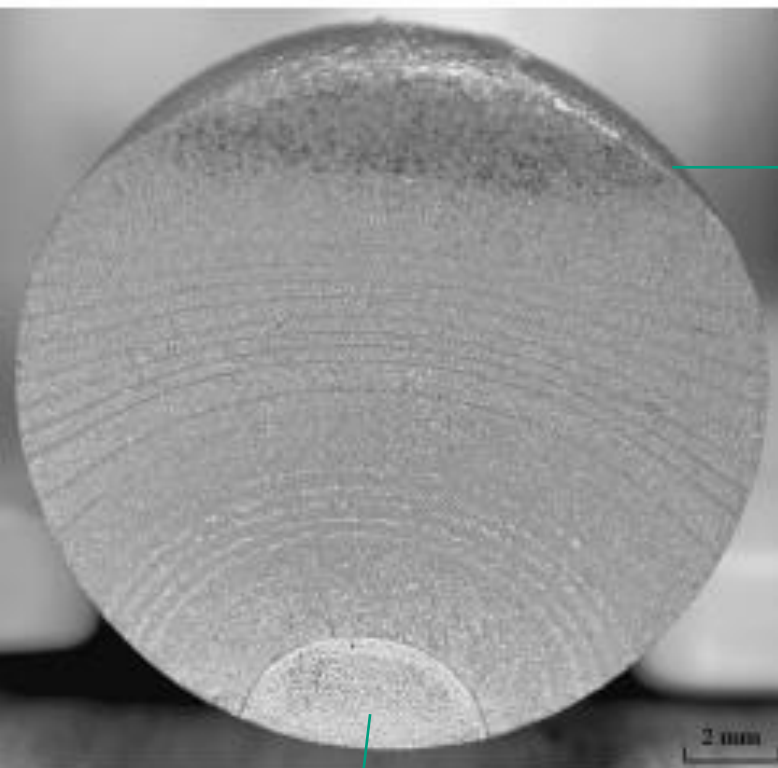


Propeller of French carrier Charles de Gaulle, 2000





Fatigue failure in metallic materials



Final fracture

Propagation

ΔK based approaches

Approaches based on non-linear parameters

Initiation

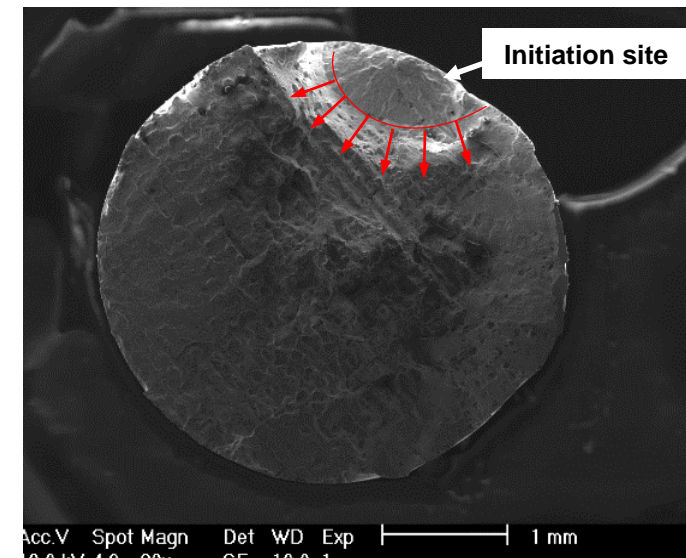
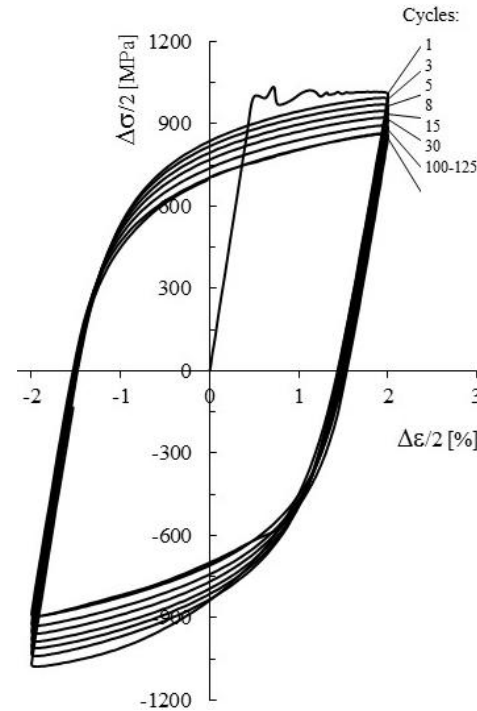
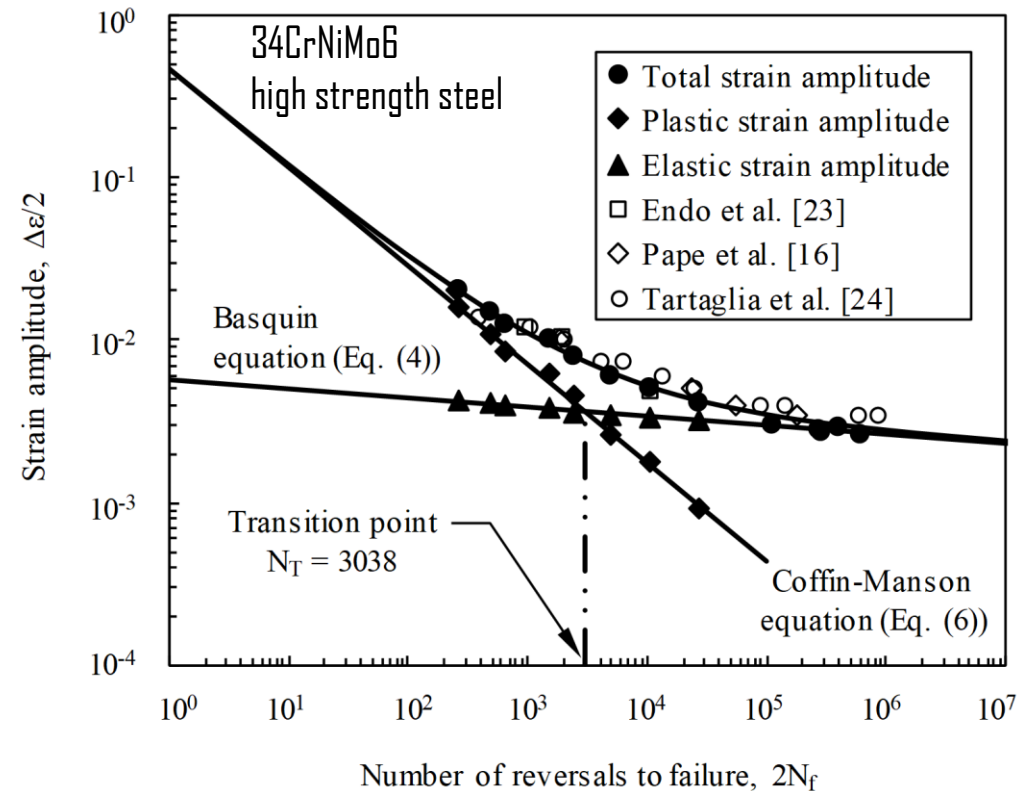
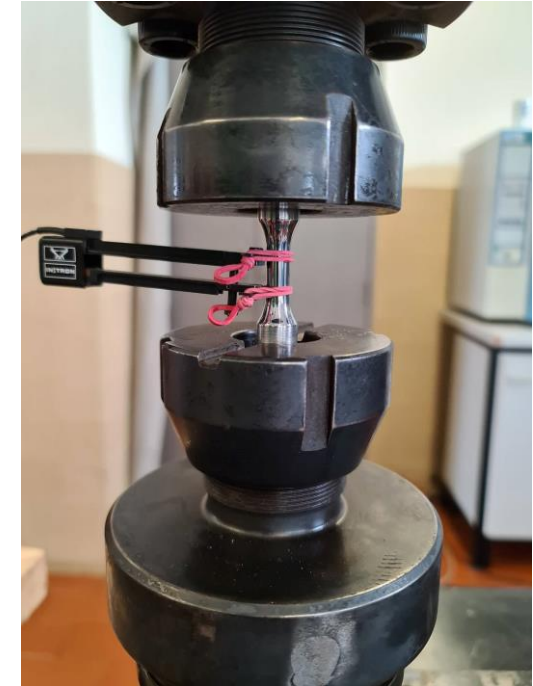
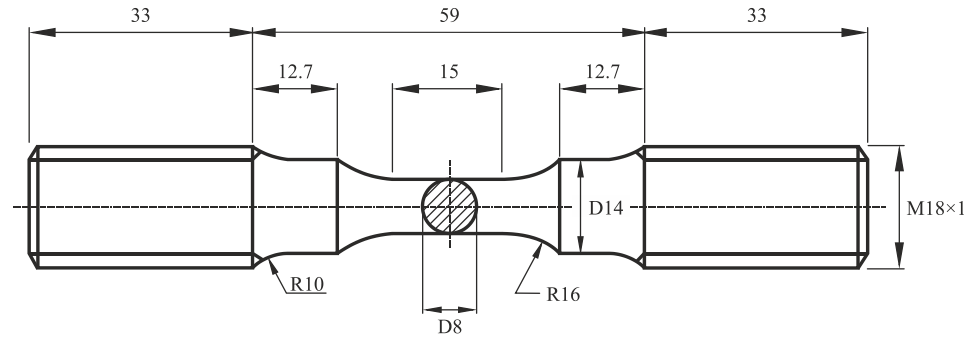
High cycle fatigue (S-N curves)

Low cycle fatigue



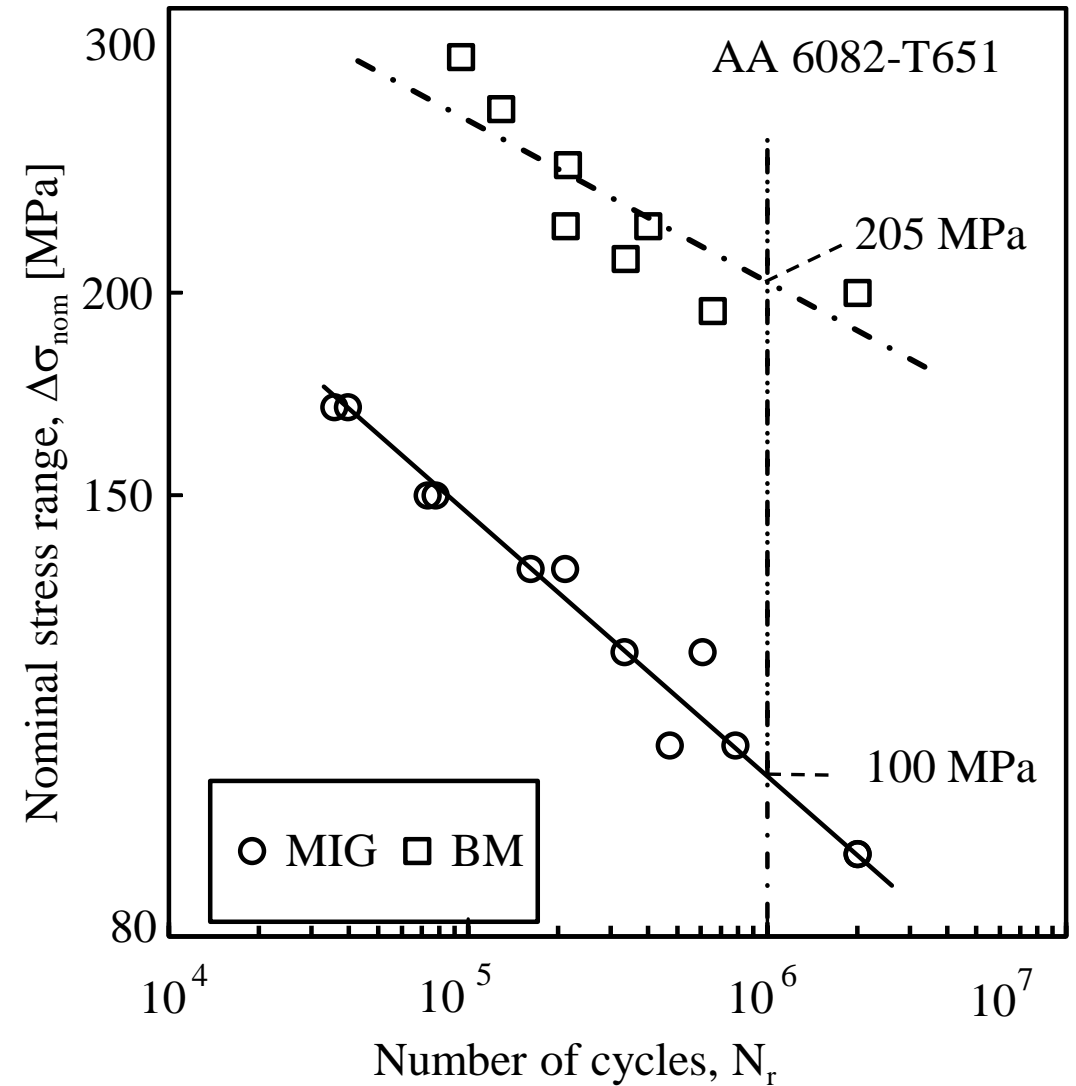
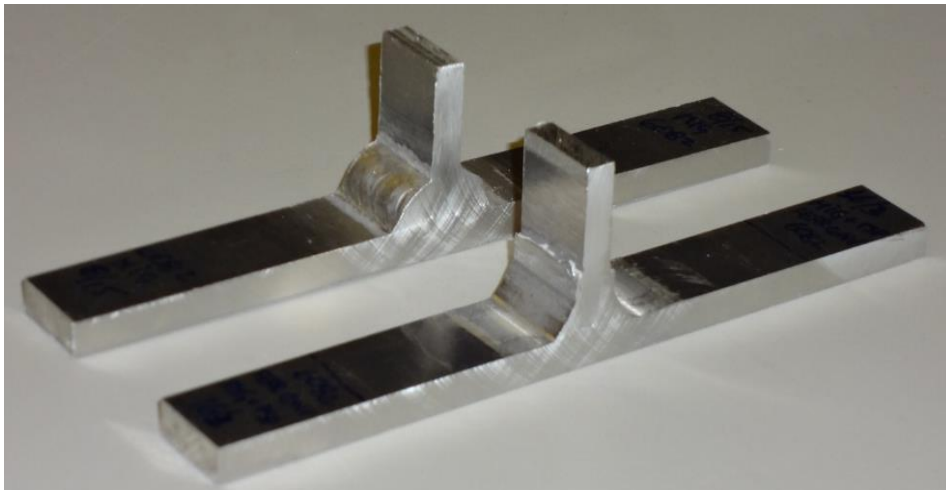
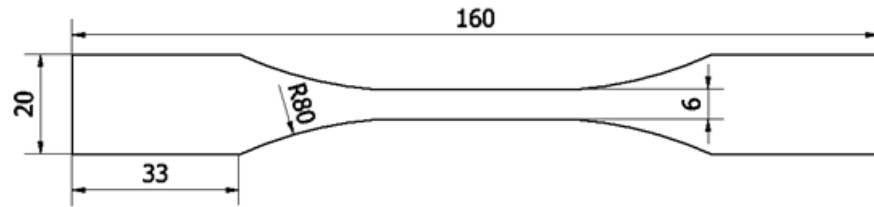
Fatigue failure in metallic materials

Low-Cycle Fatigue





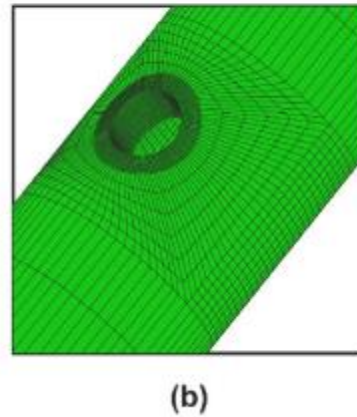
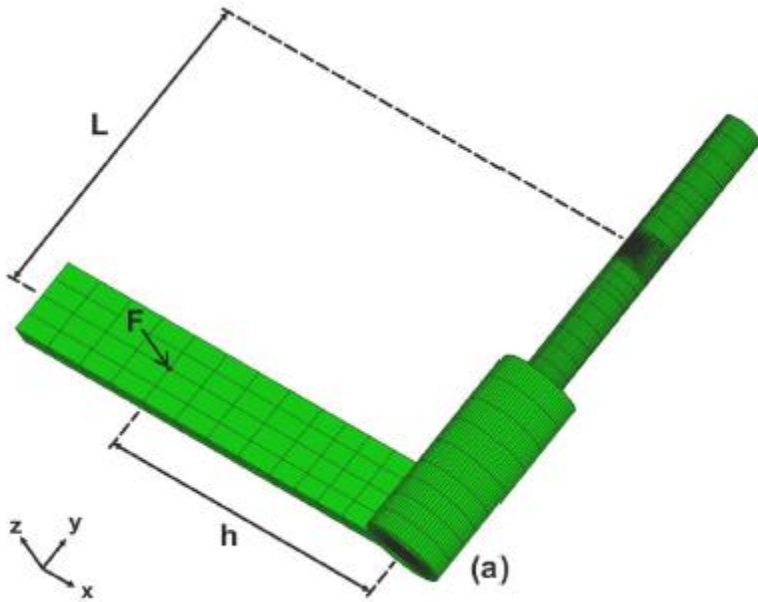
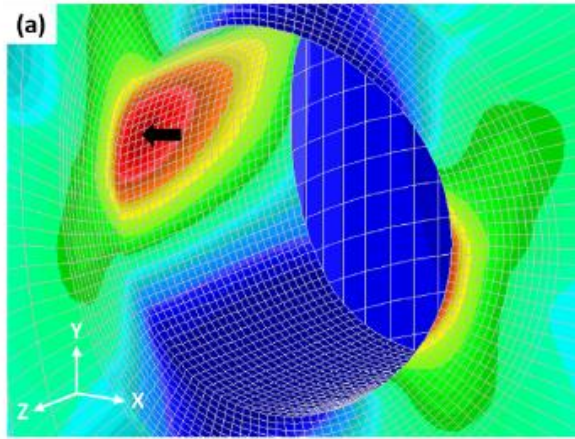
High cycle fatigue (S-N curves)



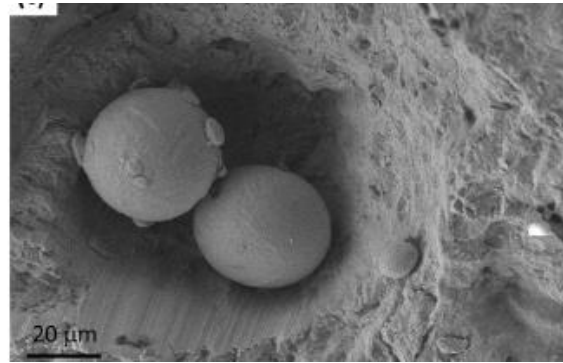


Fatigue failure in metallic materials

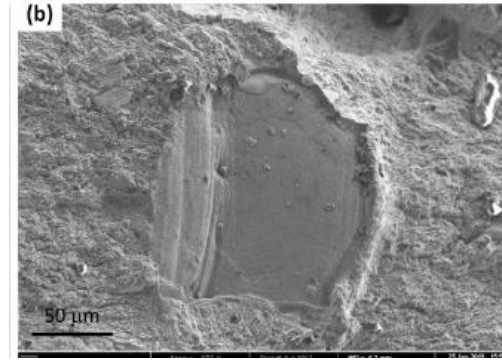
High cycle fatigue (Multi-axial fatigue)



Processing Defects



un-melted powder particles



lack of fusion



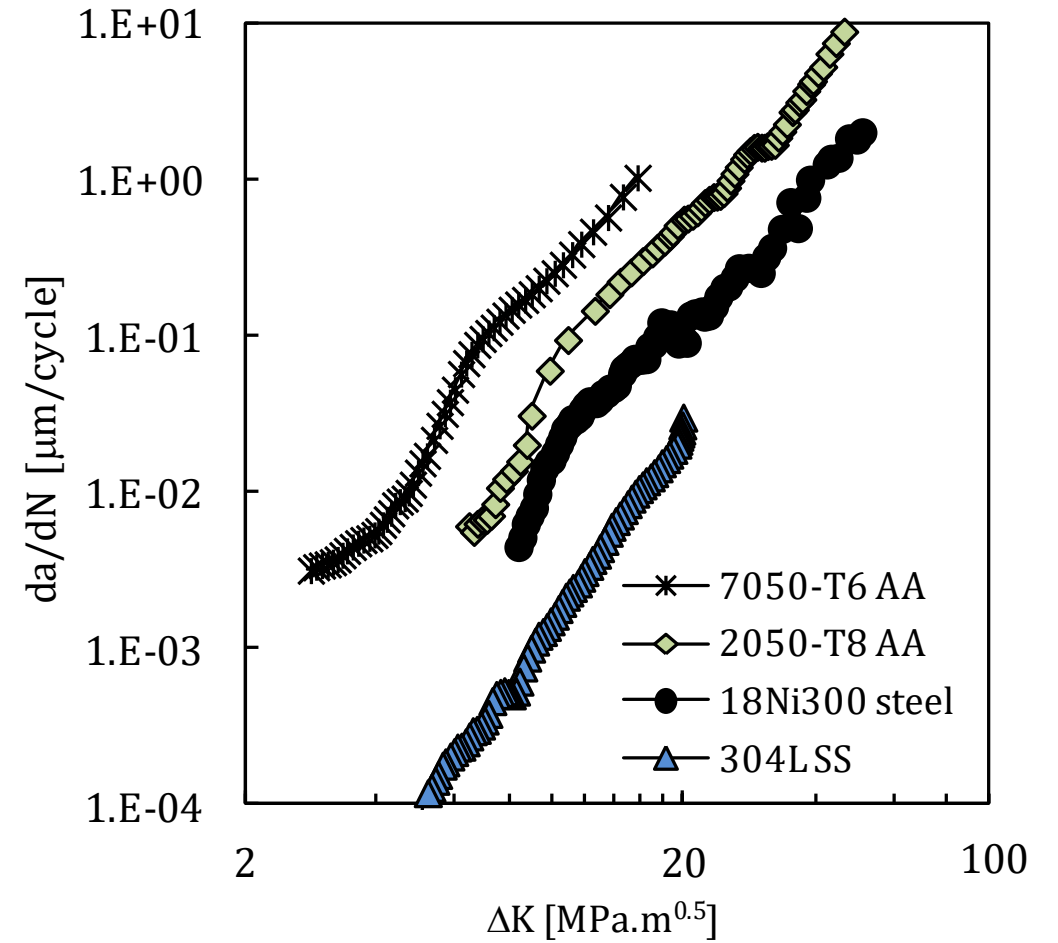
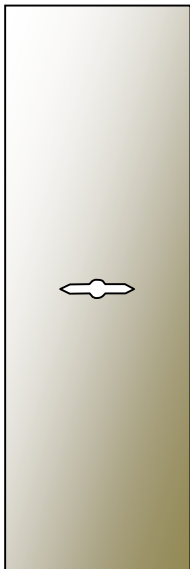
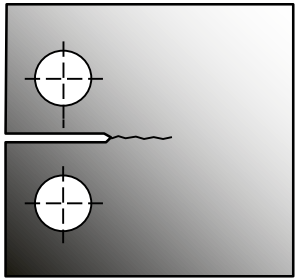
internal void





Fatigue failure in metallic materials

Fatigue crack growth: da/dN - ΔK curves



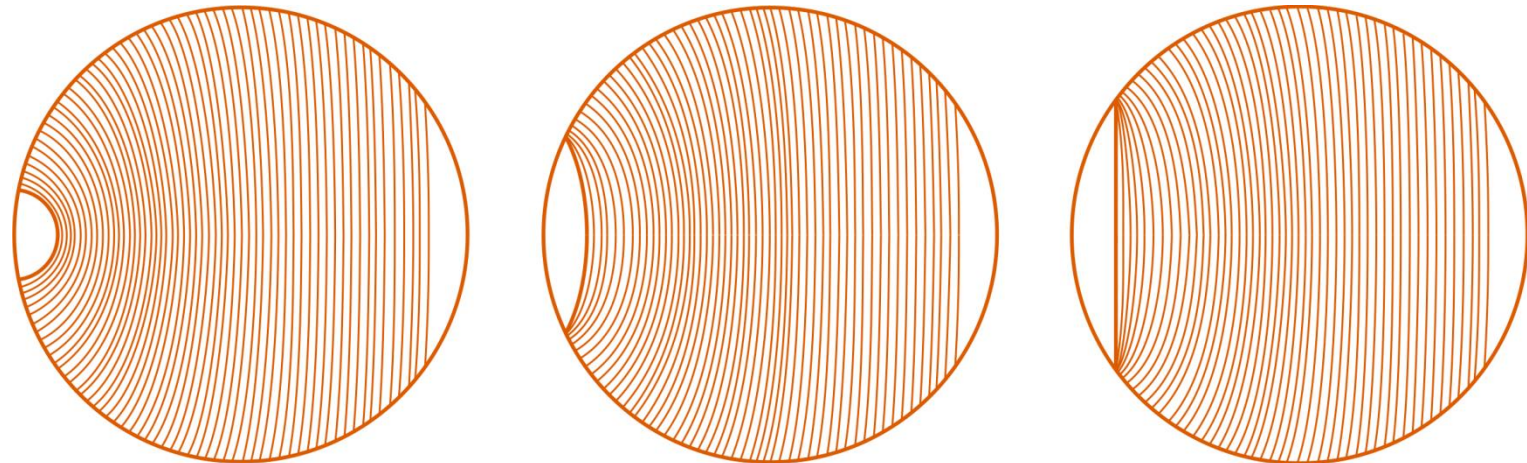
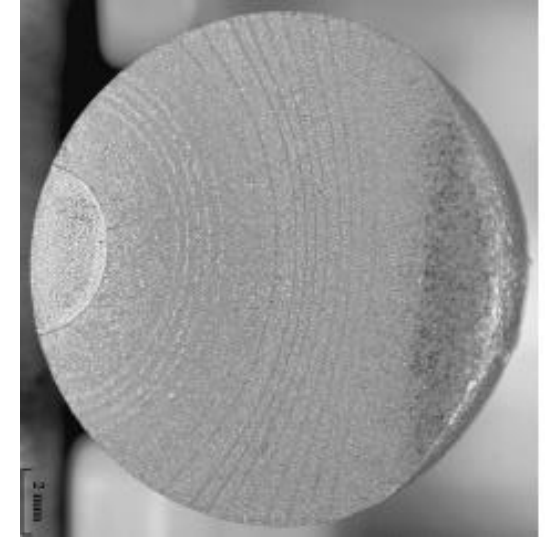
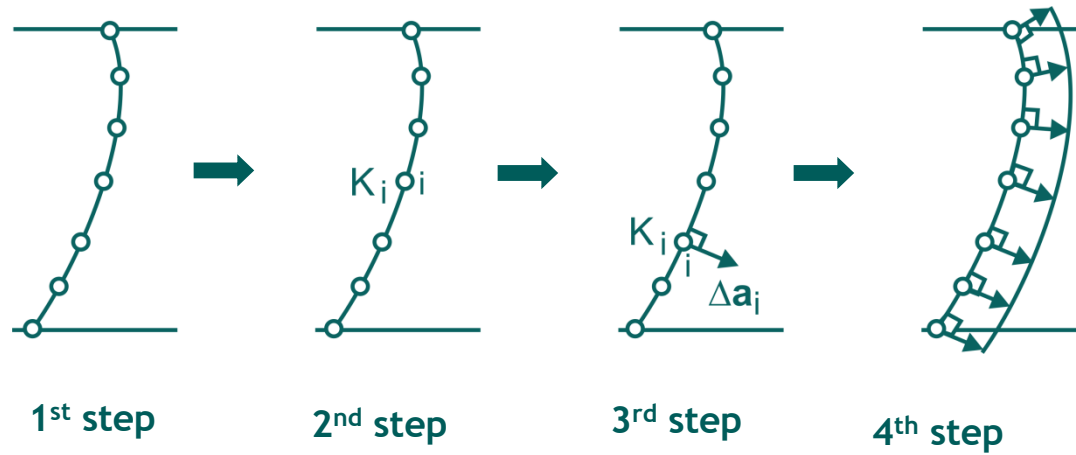
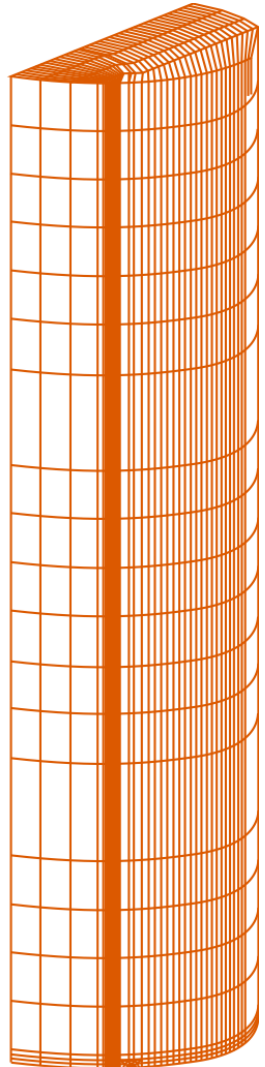
DIC equipment

SEM



Fatigue failure in metallic materials

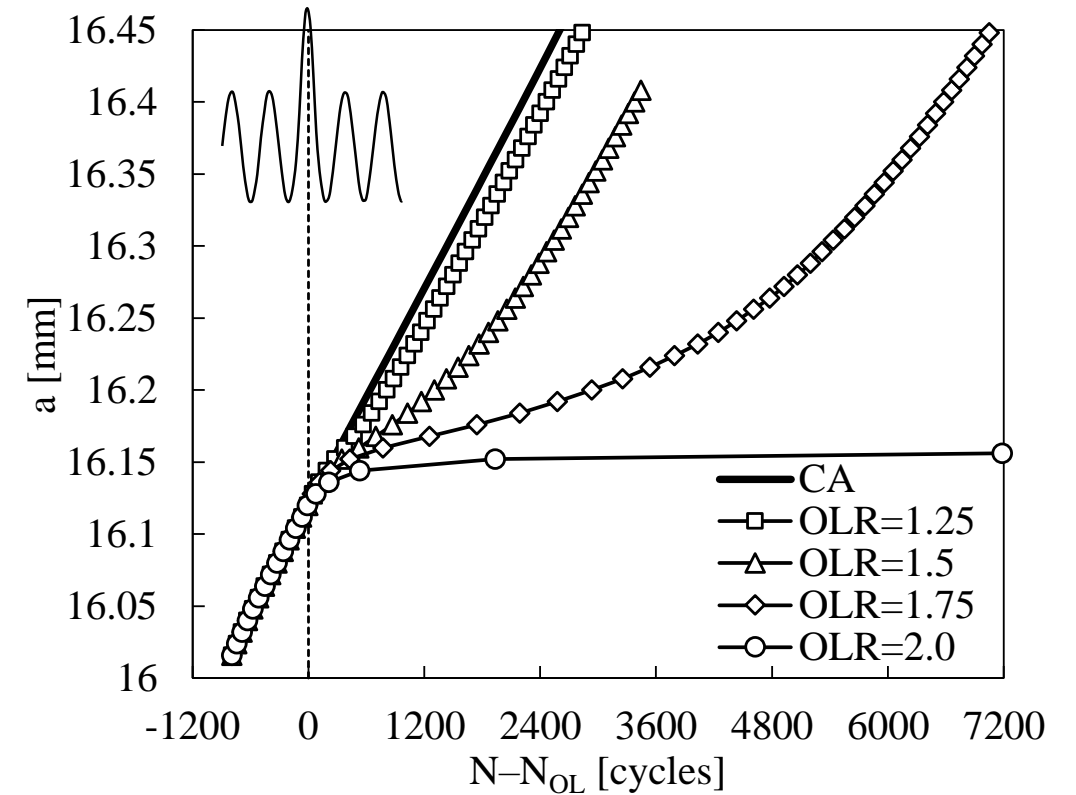
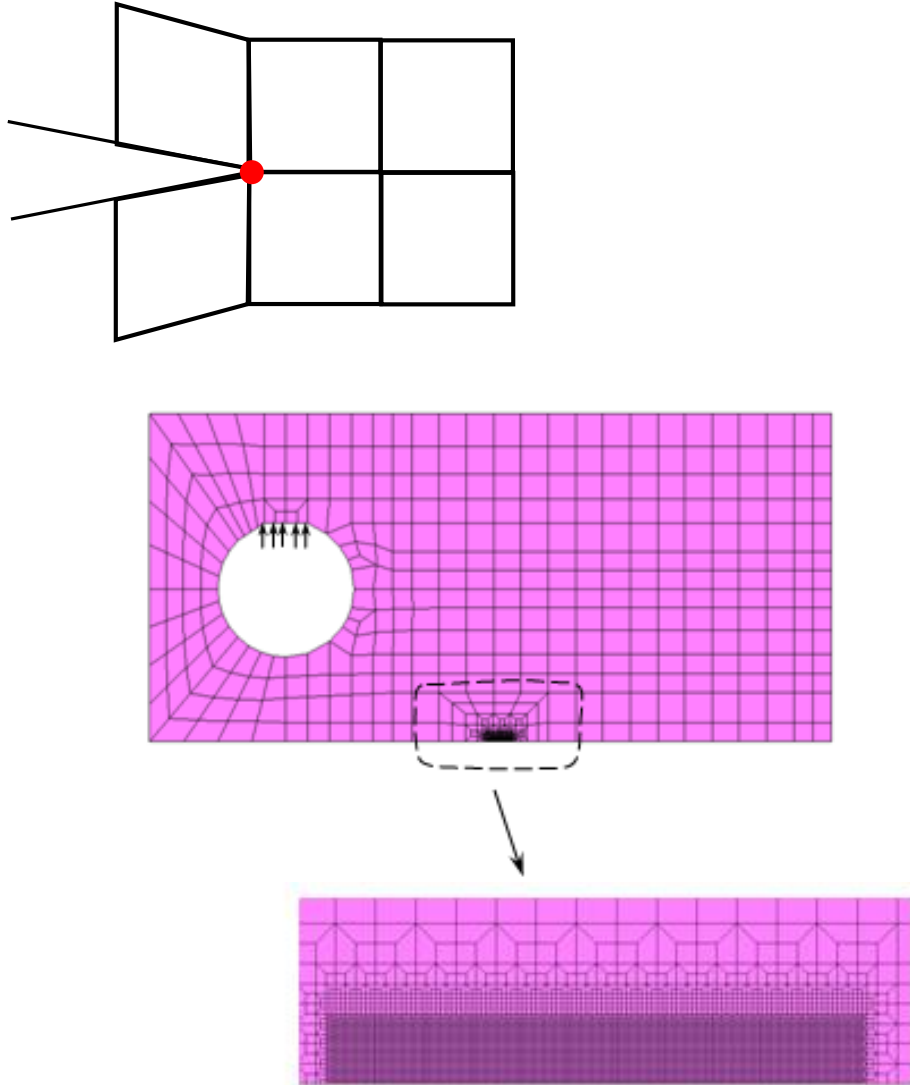
Fatigue crack growth: numerical simulation based on linear elastic analysis





Fatigue failure in metallic materials

Fatigue crack growth: numerical simulation based on non-linear analysis





Fatigue failure in metallic materials



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Thank you

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