Finemechanics course (Fracture and Reliablity Reserach Institute)

TAKEDA Laboratory

Division of Advanced Electric Power Technologies
(Joint Research with Tohoku Electric Power Co., Inc.)

FRI
Fracture and Reliability Research Institute
Established in 1964

Reduce fossil energy consumption

Reduce greenhouse gas emission

Reduce operation cost

Advanced electric power technologies for highly effective utilization of energy

Realization of resources recycle

Ensure the energy security

Research Topics

Characterization of Heat Registrant Alloys for Advanced Ultra Super Critical (A-USC) Power Plant

Coal

Stable supply is promissed

Important energy source

Advanced power generation systems;

- IGCC (Integrated coal Gasification Combined Cycle)
- A-USC (Advanced Ultra SuperCritical)

Target steam condition

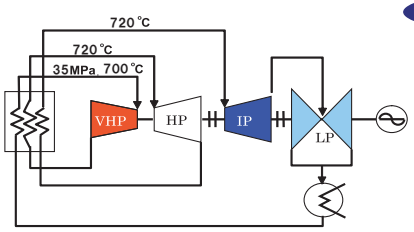
Pressure : 30 MPa
Temperature : 700℃

High temperature

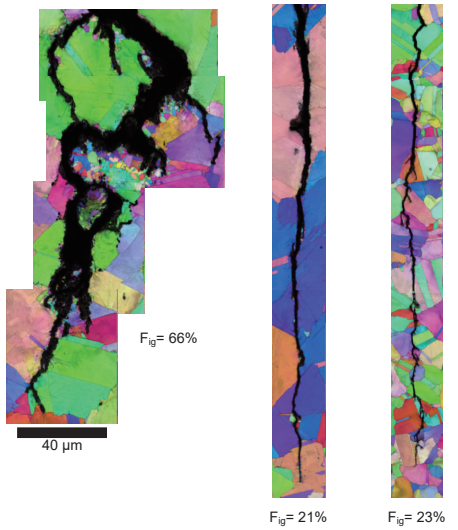
Issue

Material degradation

➡ Mechanistic studies of material degradation process



For candidate Ni-based superalloys
- Crack initiation and growth in Super-heated steam & Supercritical water
- Influence of grainboudary (GB), precipitation & carbides on crack growth and GB oxidation



Charactorisation of cracking paths under cyclic loading (F_{ig} is ratio of GB crack)

Performance Characteristic Analysis of Advanced Electric Power Generation System by Dynamic Simulator

High efficiency power generation

Heat & electricity suppy system by hydrogen containing gas

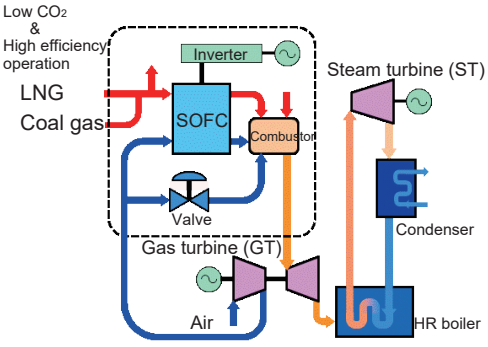
- Solid-oxide fule cell (SOFC) / gas turbine hybrid system

➡ system performance analysis by dynamic simulator

Renewable energy

➡ output fluctuation

due to its utilization of natural source



System diagram of triple GT-ST system

Research topics

- Realization of hybrid system under partial loading
- Optimization of the system under scheduled and unscheduled operations

Static & Dynamic simulation of plant conditions
- Turbine performance during start-ups and shut-down
- Rapid load following operation applicability
- Performance improvement

Locations of Lab.

Office

Engneering Laboratory Complex Building (C10)#720

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