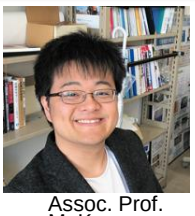
- Environmentally Robust Materials, Institute for Materials Research
- Science and Technology of Functional Materials (Cooperative Lab.), Department of Quantum Science and Energy Engineering

Akiyama Laboratory


Research

# To Overcome Hydrogen Embrittlement & Corrosion


Prof. E. Akiyama


Assoc. Prof. M. Koyama

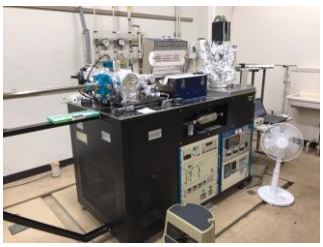

Assis. Prof. T. Hojo

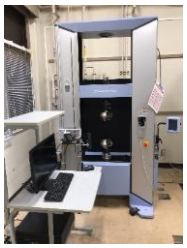

Assis. Prof. S. Ajito


Fracture of an exposed high strength bolt caused by hydrogen entry due to corrosion

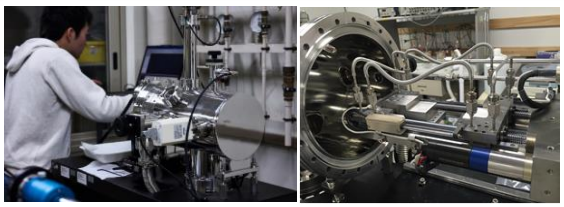
We are concentrating to clarify the mechanism of hydrogen embrittlement (HE) and to develop evaluation method for HE property of high strength steels. We also attempt to apply the interaction between hydrogen and transformation for a novel method to control microstructure. In addition, we are working on corrosion control for nuclear decommissioning.

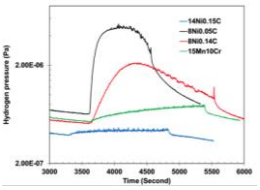
## HE mechanism & evaluation method


Thermal desorption spectrometer (Codeveloped with R-DEC Co., Ltd.)

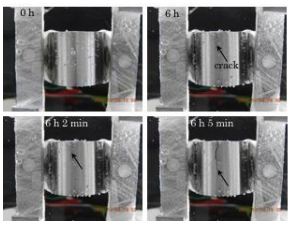

Tensile test machine

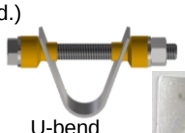
## Hydrogen and martensitic transformation

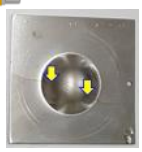

An apparatus to detect hydrogen during tensile test


Transformation induced hydrogen desorption

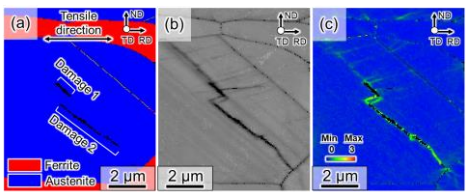
## Mechanism of crack initiation & propagation



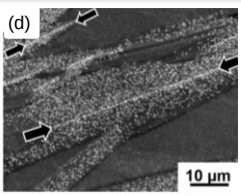


U-bend specimen


Stretch-formed specimen

Evaluation of HE property of high strength steel sheet simulating press forming



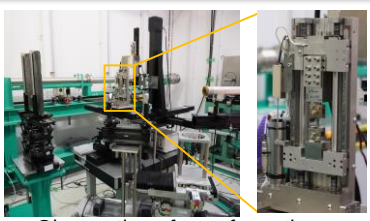
Cracking and microstructure (e.g. duplex stainless steel)

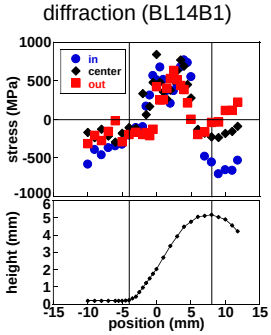


Hydrogen visualization techniques (e.g., Ag decoration technique)

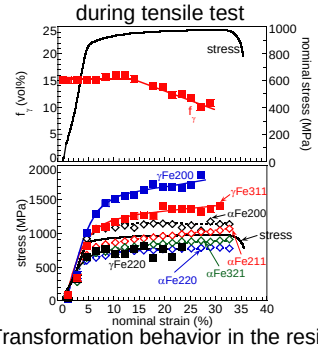
## Analyses of stress/strain distributions & martensitic transformation at SPring-8


Energy dispersive X-ray diffraction (BL14B1)


Observation of transformation during tensile test



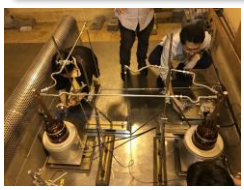
Residual stress distribution in a stretch-formed specimen

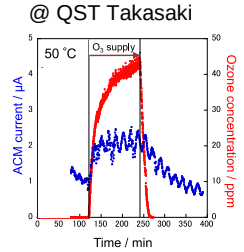


Transformation behavior in the residual γ (upper) and stress partitioning behavior in α and γ phases (lower)

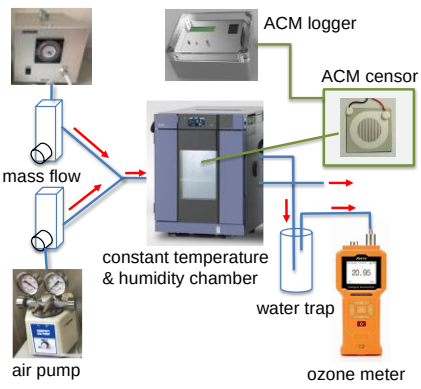
- Development of advanced steel
- Microstructural control utilizing H

## Corrosion of carbon steel under γ irradiation and simulating corrosion test


Corrosion test under g irradiation @ QST Takasaki



Acceleration of corrosion by ozone



Corrosion monitoring using an ACM sensor in a corrosion test chamber with introduced ozone