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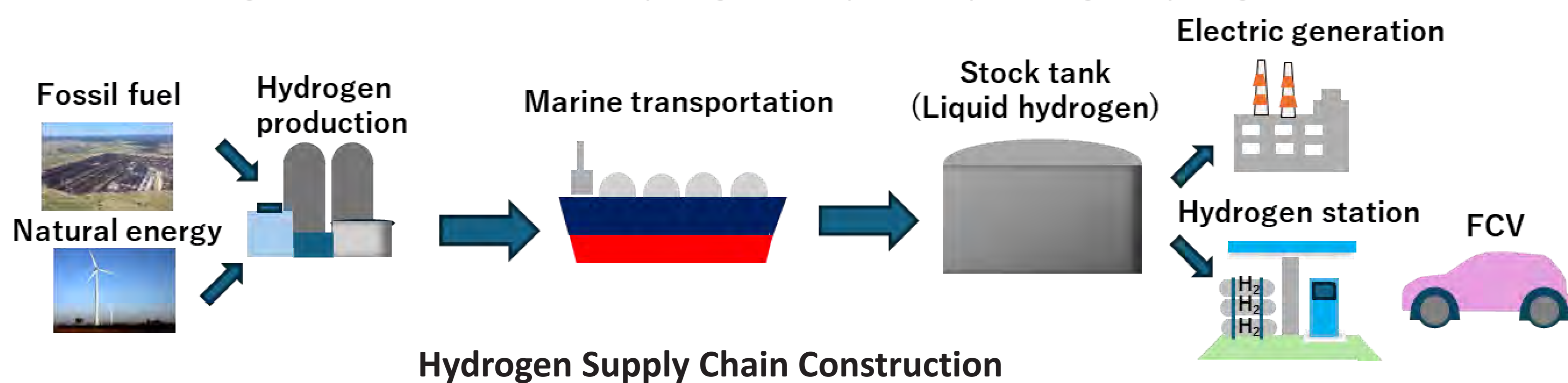
Establishment of evaluation technology for the safety use of hydrogen

Department of Fundamental Engineering

Materials for Hydrogen Embrittlement Resistance

Establishment of Material Evaluation Method in Hydrogen Gas Environments

Hydrogen energy is attracting attention for the realization of a low-carbon society. In addition, the expansion of the transportation and storage of liquid hydrogen for future large-scale hydrogen use is being considered. On the other hand, when metallic materials are exposed to hydrogen environments, hydrogen atoms enter the material, and cause hydrogen embrittlement. Therefore, hydrogen compatible test methods have been required to select suitable materials in many fields, including hydrogen stations and large liquid hydrogen storage tanks etc.. We have conducted to achieve global harmonization of hydrogen compatibility testing in hydrogen environment.



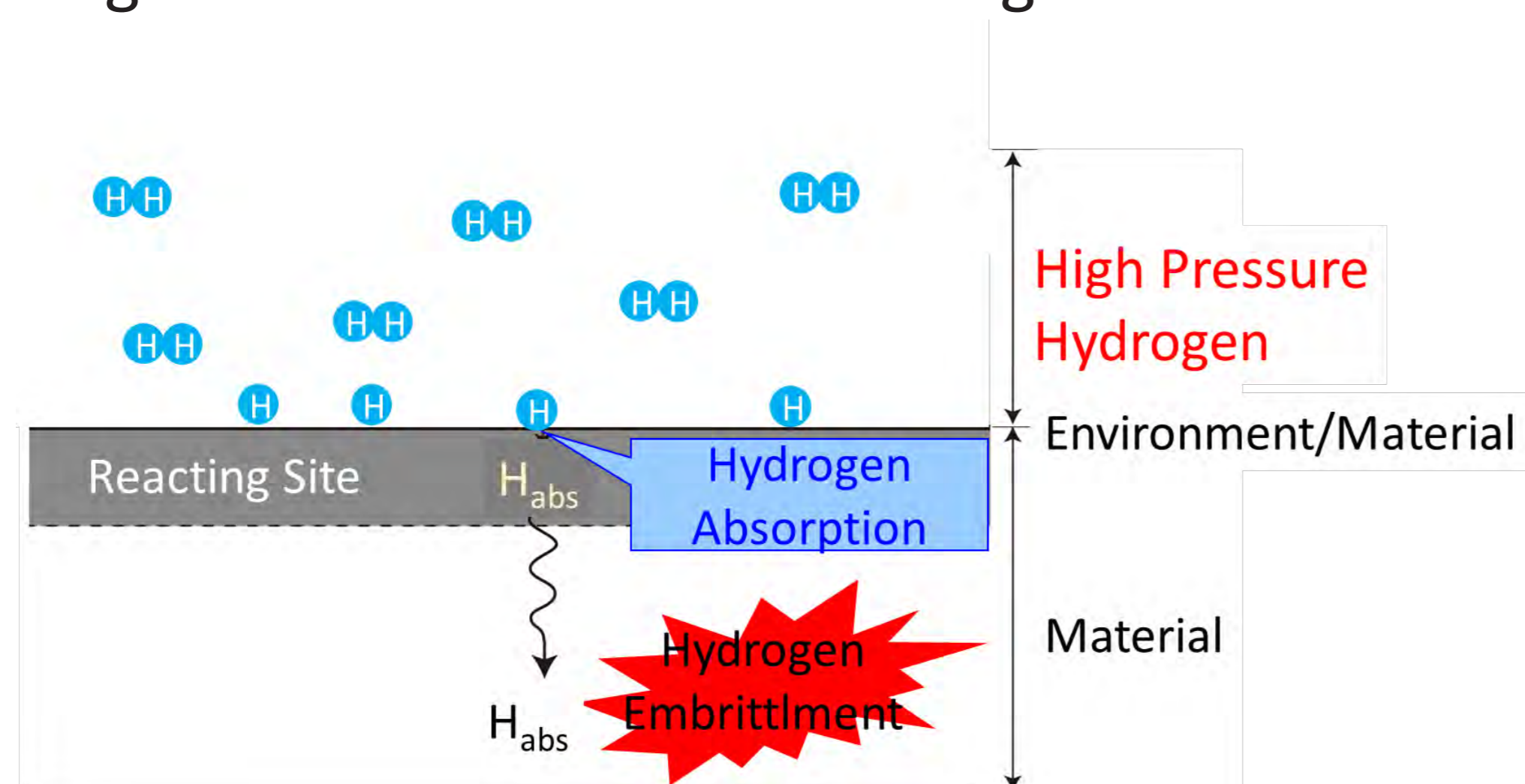
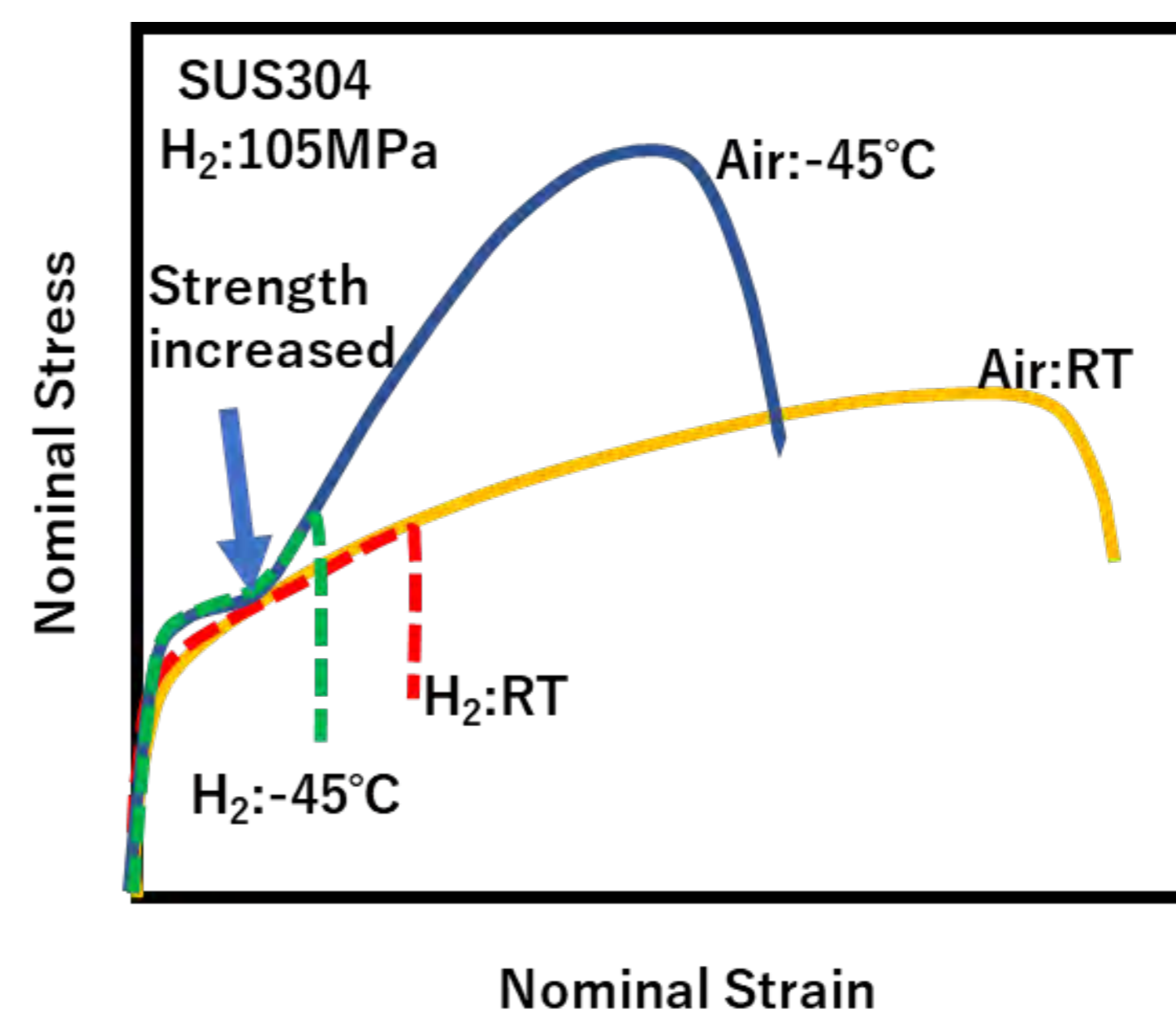
Mechanism of Hydrogen embrittlement

- ① Hydrogen atoms adsorb on the material surface
- ② Hydrogen atoms penetrate the interface of material
- ③ Hydrogen atoms diffuse in materials

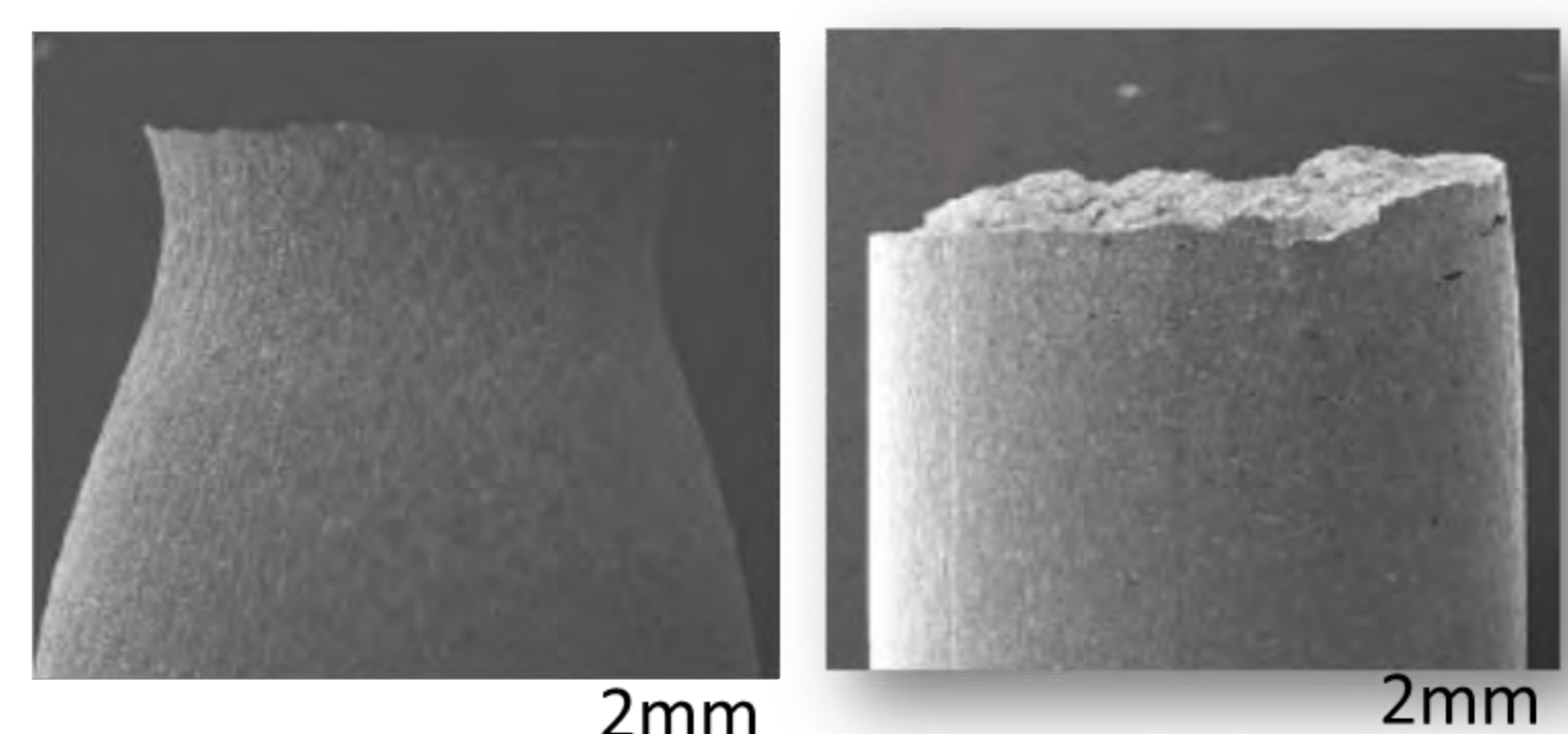
Hydrogen Compatibility Testing

The hydrogen compatibility of metallic materials used in high pressure hydrogen environments have been evaluated by following testing methods.

- ① Slow Strain Rate Technique (SSRT) Testing
- ② Fatigue Life Testing
- ③ Fatigue Crack Growth Rate Testing



Mechanism of hydrogen embrittlement in hydrogen gaseous environments



Appearance of SSRT tested specimens