Exhibition and demonstration of hydrogen vehicle

Yoshikawa Lab.

[Computational Solid Mechanics for Technologies Building Hydrogen Economy]

Center for Research on Innovative Simulation Software

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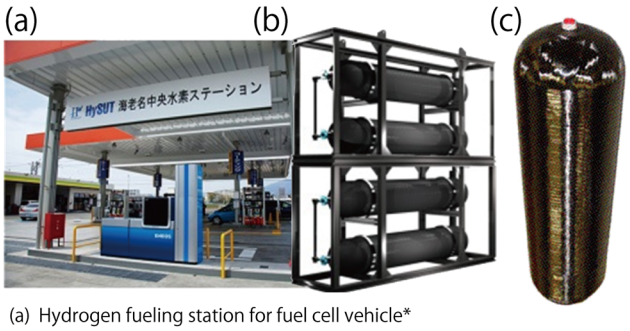
Multi-scale solid mechanics

Graduate school of engineering, Department of Mechanical Engineering

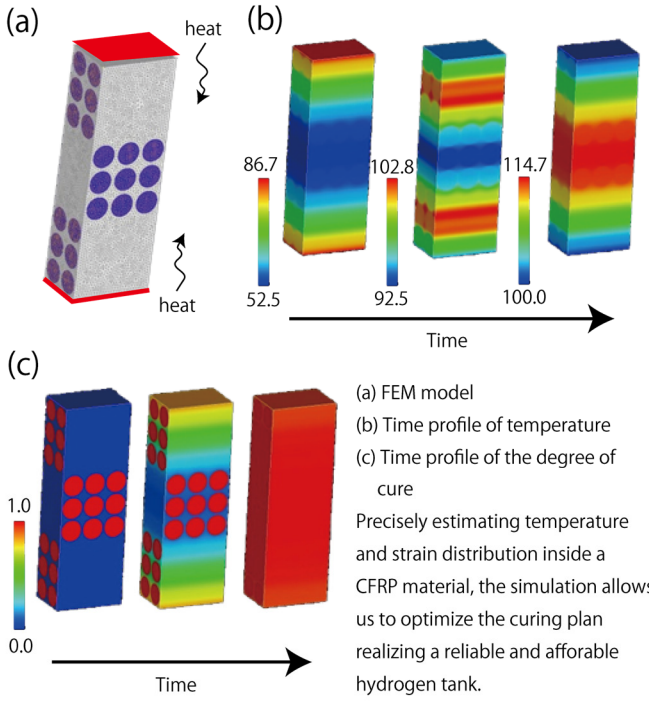
Simulation-aided design and production of CFRP high-pressure tank for hydrogen infrastructure



(a) Hydrogen fueling station for fuel cell vehicle*
(b) Hydrogen accumulator* (c) High-pressure hydrogen tank**

* http://www.samtech.co.jp/products/hpc.html
** http://www.f-suiso.jp/bunkakai/H22bunnkakai/22_6_1_toujou.pdf

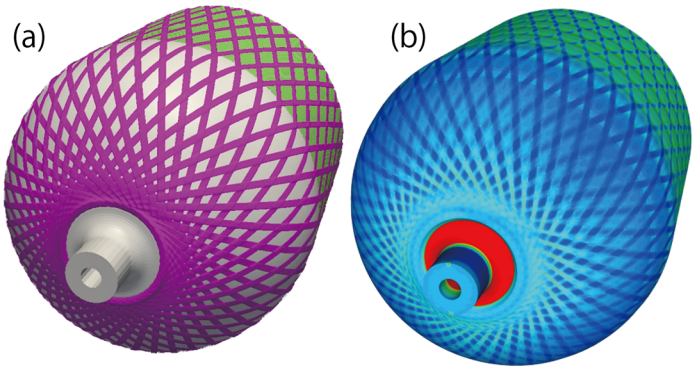
Optimization of curing process



(a) FEM model
(b) Time profile of temperature
(c) Time profile of the degree of cure

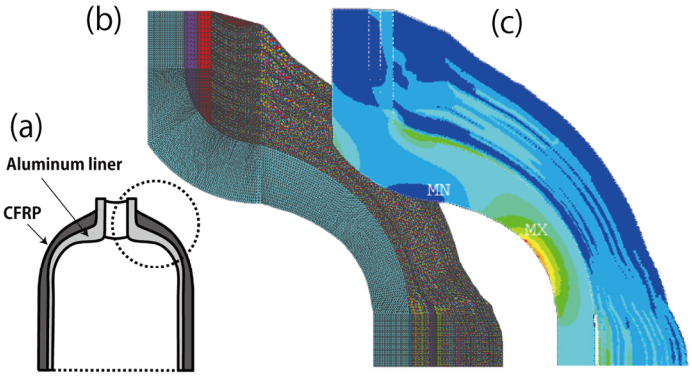
Precisely estimating temperature and strain distribution inside a CFRP material, the simulation allows us to optimize the curing plan realizing a reliable and afforable hydrogen tank.

Optimization of meso-scale parameters



(a) Meso-scale FEM model consisting of aluminum liner, fiber, and plastic resin
(b) Mises stress distribution The aim of this study, with a supercomputer, is to optimize geometric parameters of fiber bundles by estimating the local stress concentration in the vicinity of the crossover site of two fiber bundles.

Strength of dome part of hydrogen tank



(a) Intersection of tank：aluminum liner and CFRP composites
(b) FEM model for anisotropic CFRP laminates (c) Mises stress distribution
The simulation precisely modeling the laminate structure of anisotropic CFRP layers allows us to optimize the structure for a compact tank.