

# Accelerate the R&D with Materials Integration

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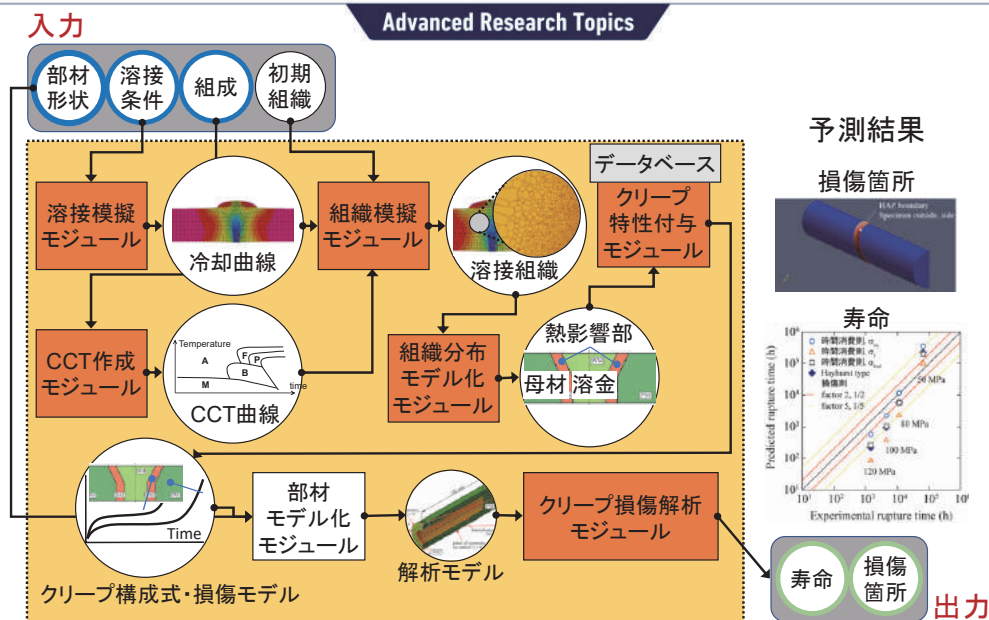


## Background

- Strong demand for new materials requires an acceleration of the R&D.
- It takes huge time & cost to prove the performance particularly in structural materials.
- We need a new R&D methodology for the acceleration.

## Aim

- Build a new R&D methodology named "Materials Integration."
- Use all the possible digital resources including experimental data, databases, theoretical / empirical formula, computational simulations with a help of data science.
- Solve complicated problems with workflows consisting of linked modules.



A workflow system consisting of several modules linked for predicting the lifetime of a weld joint of heat-resistant steels.

## Publications

- K. Koiwa, M. Tabuchi, M. Demura, M. Yamazaki, M. Watanabe, "Prediction of Creep Rupture Time Using Constitutive Laws and Damage Rules in 9Cr1MoVNb Steel Welds," accepted in Materials Transactions
- D. S. Bulgarevich, S. Tsukamoto, T. Kasuya, M. Demura, and M. Watanabe, "Pattern recognition with machine learning on optical microscopy images of typical metallurgical microstructures," Scientific Reports (2018) 8:2078.

## Summary

- For weld parts of steels, we have developed the materials integration system to predict the lifetime from the process.
- One can extract the formation necessary for the prediction from databases by data scientific methods

## Research outcome

- Apply the system for more realistic materials through collaborative researches with industry
- Develop an inverse approach to optimize the process parameters from required performance.