

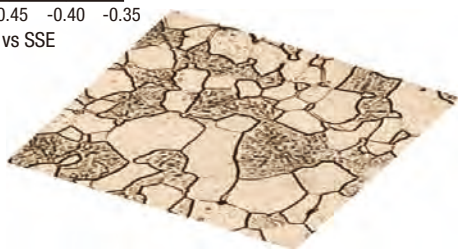
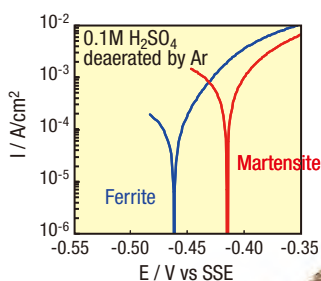
# Material Surface & Interface Science



We pioneer the scientific approach to acquire the technologies for corrosion & protection and prevention of hydrogen embrittlement, elucidating the mechanisms of interfacial reactions yielding to corrosion and hydrogen intrusion causing embrittlement.

## Mechanism of Corrosion & Corrosion Protection

Based on the fundamental questions of “why” and “how” corrosion occurs in steel materials, JFE Steel aims to create new corrosion resistant materials and corrosion protection technologies by applying leading edge analytical techniques and electrochemical measurement technologies to clarify the dependency of the corrosion mechanism of steel on the corrosion environment and steel microstructure.



Steel phase dependence of electrochemical behavior of a dual phase steel

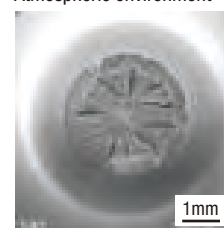
## Mechanism of Hydrogen Embrittlement

Using the world’s most advanced measurement and analysis techniques, we are taking on the challenges of elucidating the mechanism by which hydrogen that penetrates into steel materials in various environments deteriorates the properties of the steel, and preventing the phenomenon of hydrogen embrittlement.

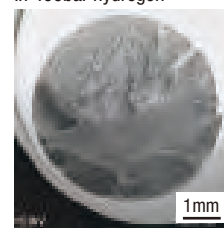


Apparatus for exposure test in 1000 bar hydrogen environment

Atmospheric environment



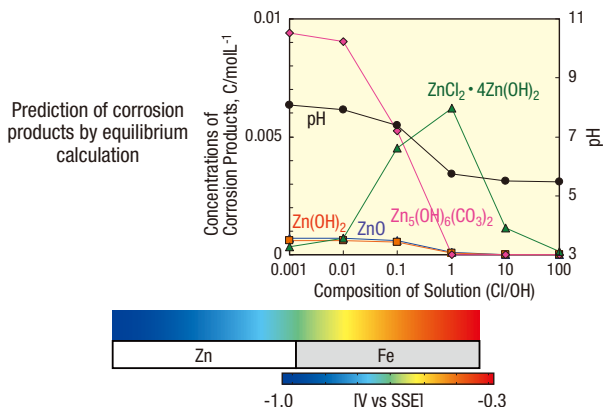
In 400bar hydrogen



Effect of hydrogen on fracture surface in tensile test

## Corrosion Simulation Techniques

The experimental approach alone is not always sufficient for understanding and prediction of corrosion behaviors. We are also engaged in research and development related to simulation of corrosion products and corrosion initiation by chemical equilibrium calculations, the finite element method (FEM), etc.



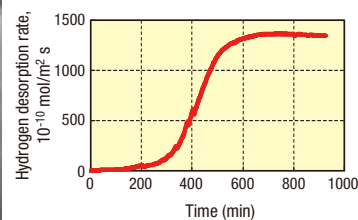
Example of calculation of potential distribution between Zn and Fe in a solution

## Hydrogen Embrittlement Evaluation Technology

With the aim of establishing a technology which can contribute to a hydrogen energy society, we are developing methods for evaluating the behavior of hydrogen which permeates and diffuses in steel materials and the mechanical properties of those materials under high pressure hydrogen environments, and to elucidate Hydrogen Existing States in steels.



High pressure hydrogen gas permeation test device (1000bar)



Example of hydrogen permeation test data under 1000bar H<sub>2</sub> gas environment (high strength steel)