Analysis/evaluation, investigation, and analysis technology for next-generation automobiles

Tenth International Conference on Fluid Dynamics(ICFD2013)

November 26th 2013

Tetsuya Mega, Takahiro Inoue and Fumiko Ikebe
JFE Techno-Research Corporation

Business Policy

Your Best Partner for "*Monodzukuri*"

JFE Techno-Research Corporation aims to be the client's best partner in solving technical problems related to "*monodzukuri*" (Japanese-style manufacturing).

In a wide range of fields from the nano region to large-scale structures, we provide high reliability analysis and evaluation technologies using state-of-the-art analysis and testing equipment. Our technical staff of 500 experts possesses a wealth of experience, and is ready to assist clients in solving technical problems in all aspects of "*monodzukuri*" : such as stabilization of product quality, added functions, and reduction of production costs.

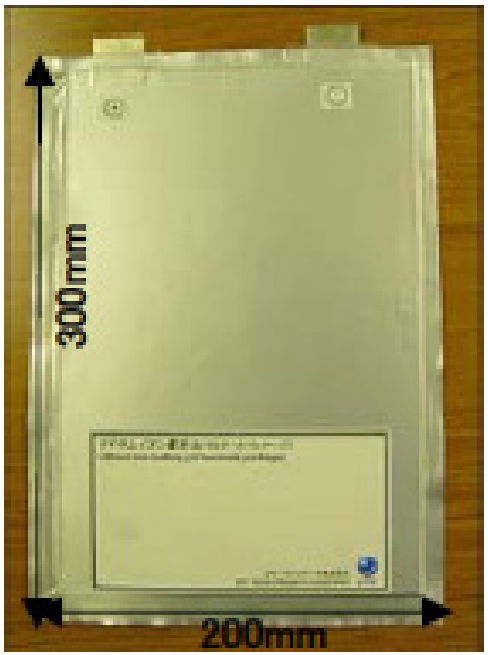
0. Introduction

This presentation introduces the following analysis and evaluation technologies:

1. Evaluation of next-generation battery materials,
2. Analysis of nano-region fine structure,
3. Characterization of material properties,
4. Trace and environmental analysis techniques,
5. Evaluation of surface-treated materials,
6. Evaluation of structural performance and dismantled investigation,
7. Non-destructive testing and numerical analysis.

1.Evaluation of battery materials

Our technical services;
(1) Lithium ion cell prototyping service
(coin-type cell and laminate-type cell),
(2) Charge and discharge performance evaluation,
(3) Battery material analyses such as cross-sectional SEM and/or TEM observation (also in-situ analysis), without exposure to air.



Laminate type cell
(capacity: 1.7 Ah)

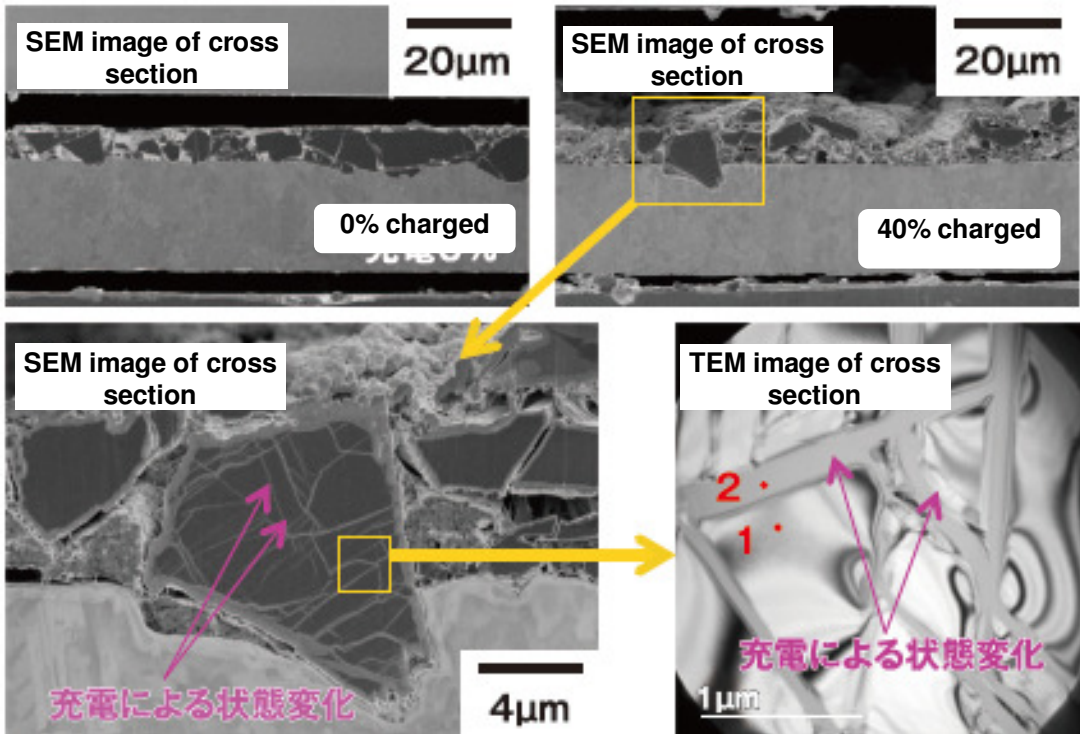
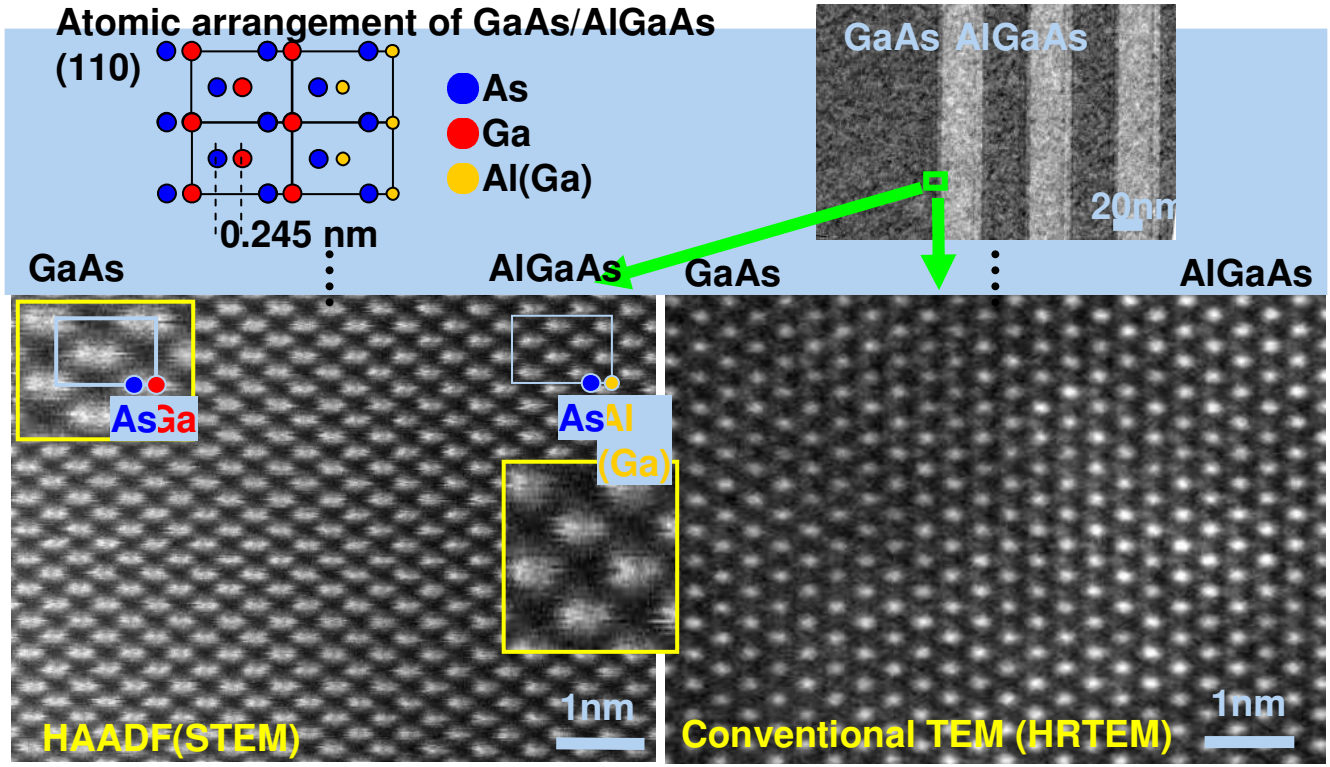


Fig. Cross-sectional views of battery materials

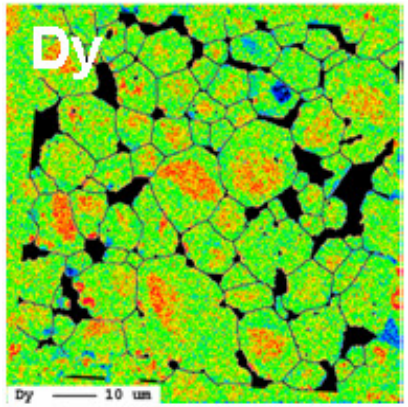
2. Analysis of nano-region fine structure

(1) Using atomic resolved CS-STEM, for advanced material as power devices, thermoelectric element modules, and catalysts,
(2) FIB sample processing with a cryo-system to obtain excellent images,
(3) High resolution EBSD and FE-EPMA are possible to visualize the distribution of rare earth elements as Dy at grain boundaries Nd-Fe-B.



(Right) With conventional TEM, discrimination of atoms was difficult, and only the period of atoms could be observed.
(Left) From the HAADF image of an ultra-high resolution TEM, the positions of atoms can be designated and the individual atoms can be observed.

Atomic resolved CS-STEM



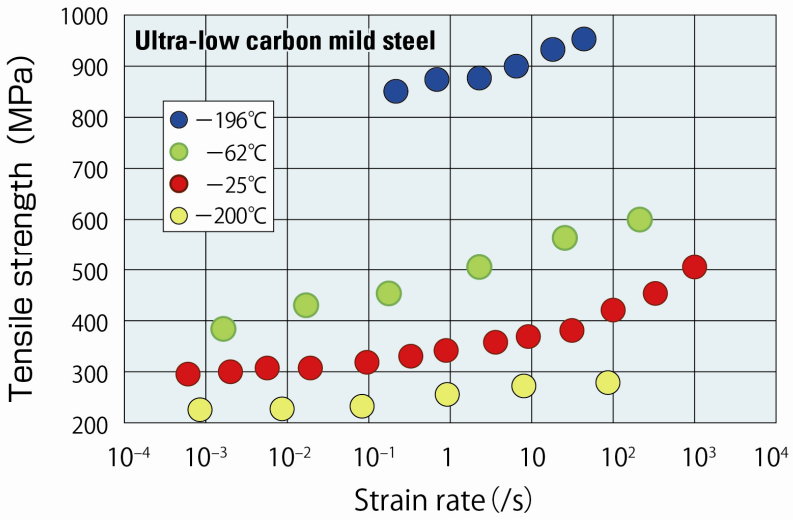
FE-EPMA grain map and Dy map

3. Characterization of material properties

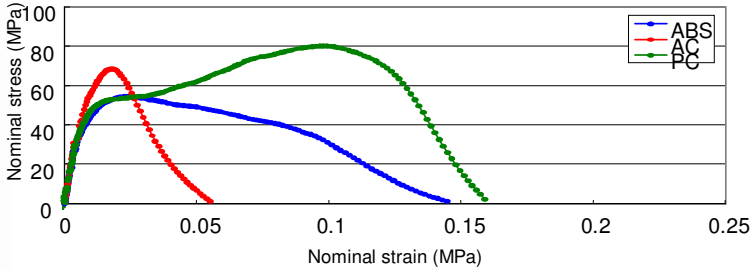
(1) Evaluation of material behavior (strength) at high strain rates, at temperatures from -196℃ to 400℃ , fatigue, fracture characteristics, and creep, for steels, metals, and resin materials

(2) Corrosion research, anti-corrosion technology, and magnetic characterization,

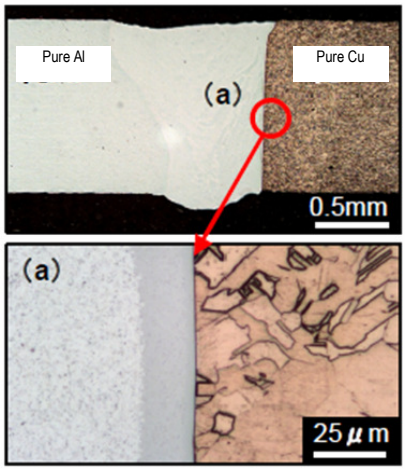
(3) Providing laser and CO2 welding technologies for dissimilar material joints and evaluations of weldability and joint quality.



Effect of strain rate and testing temperature on tensile strength



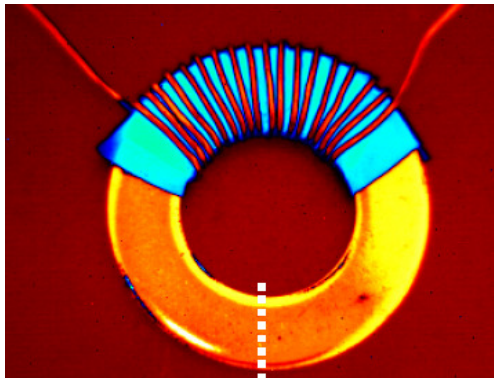
S-s curves of ABS resin (ABS), acryl (AC), polycarbonate (PC) at room temperature, with strain rate: 1000/s

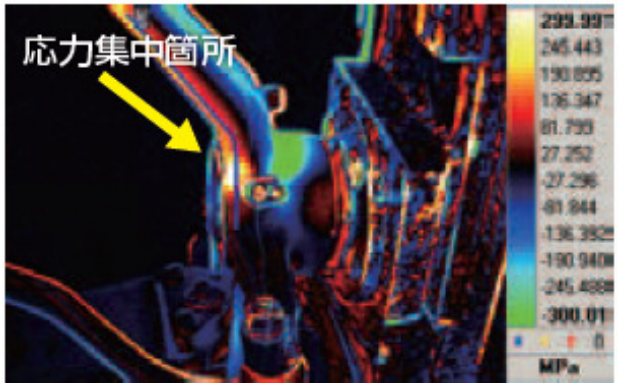


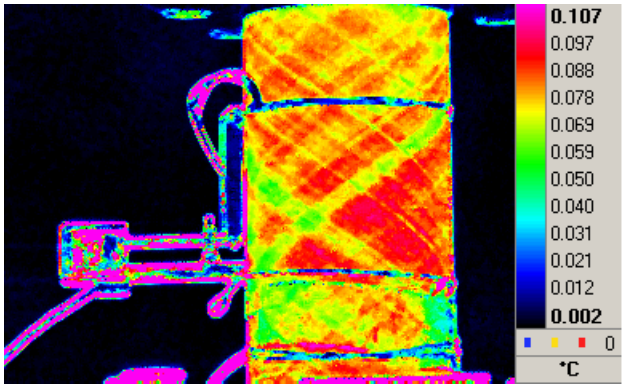
Cross-sectional observation of Al-Cu dissimilar material joint using laser welding [Joint strength: 80 MPa

7. Non-destructive and numerical analysis.

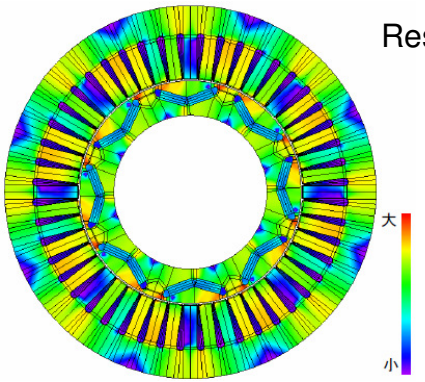
(1) Thermal analysis of magnetic materials and stress distribution measurements using high performance infrared camera techniques,
(2) Surface and internal defect detection, such as thin films with different thickness distributions, using the imaging spectrometer and dry ultrasonic spectrometer,
(3) Combination with numerical simulation analysis for verification between experimental results and numerical analysis.







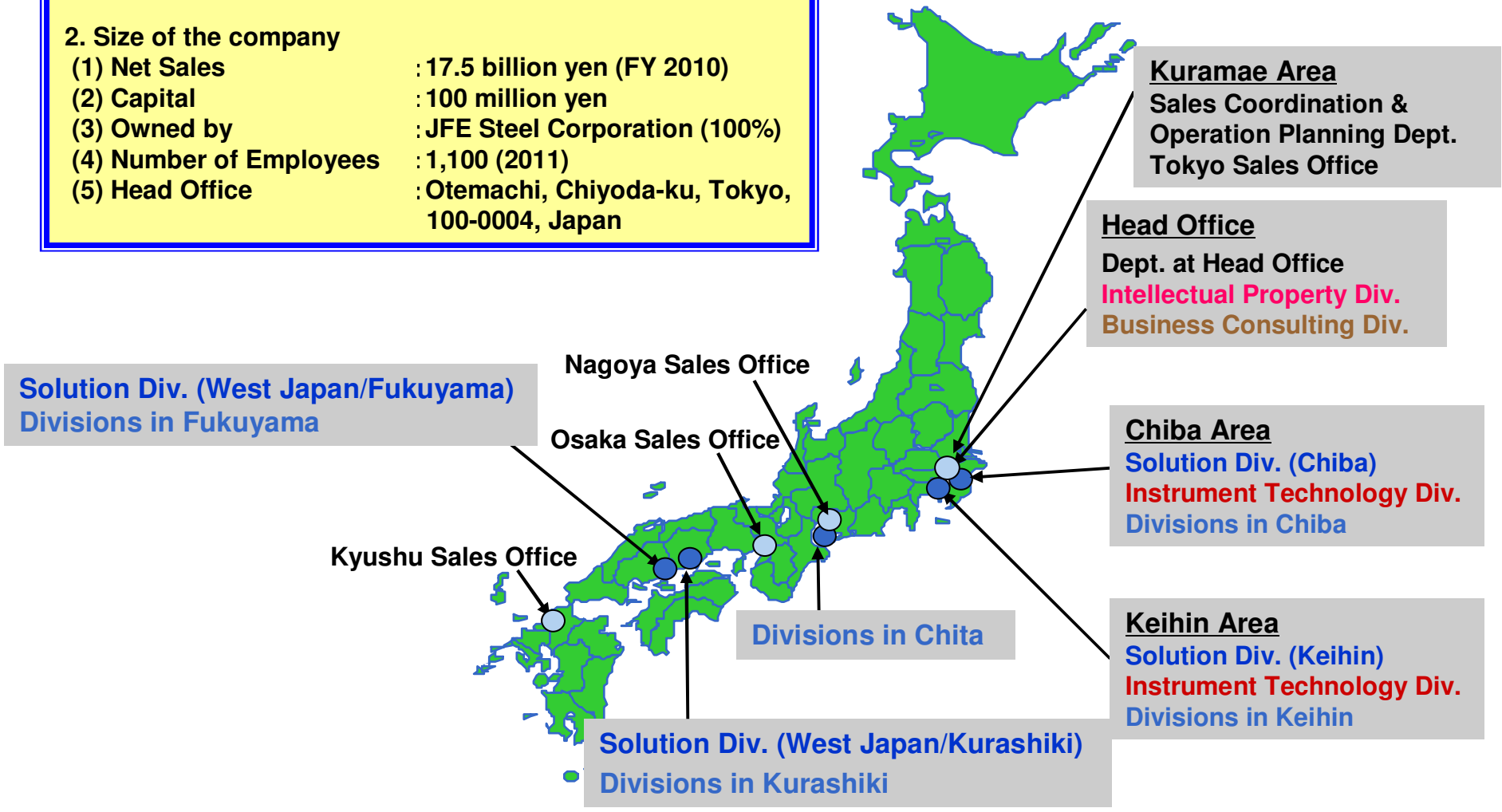
Results of stress distribution measurement with high performance infrared camera and heat analysis



Numerical analysis (magnetic induction)
of motor for electric vehicles

Company Outline and Major Business Locations

1. Established	:	October 1, 2004
2. Size of the company		
(1) Net Sales	:	17.5 billion yen (FY 2010)
(2) Capital	:	100 million yen
(3) Owned by	:	JFE Steel Corporation (100%)
(4) Number of Employees	:	1,100 (2011)
(5) Head Office	:	Otemachi, Chiyoda-ku, Tokyo, 100-0004, Japan



Results:Our Commitment

Your Best Partner for "*Monodzukuri*"

JFE Techno-Research Corporation aims to be the client's best partner in solving technical problems related to "Monodzukuri" (Japanese-style manufacturing).

Please feel free to consult us!