実験報告書様式(一般利用課題・成果公開利用)

(※本報告書は英語で記述してください。ただし、産業利用課題として採択されている方は日本語で記述していただいても結構です。)

# MLF Experimental Report	提出日 Date of Report
課題番号 Project No. 2014B0134 実験課題名 Title of experiment Direct observation of water motion under blister of under-film corroded steels by ultra-bright neutron imaging technique 実験責任者名 Name of principal investigator Atsushi Taketani 所属 Affiliation RIKEN	装置責任者 Name of responsible person Kenichi Oikawa 装置名 Name of Instrument/(BL No.) Noboru (BL-10) 実施日 Date of Experiment 2016/3/28- 3/31

試料、実験方法、利用の結果得られた主なデータ、考察、結論等を、記述して下さい。(適宜、図表添付のこと)
Please report your samples, experimental method and results, discussion and conclusions. Please add figures and tables for better explanation.

1. 試料 Name of sample(s) and chemical formula, or compositions including physical form.

Organic Film-coated steel samples with under-film corrosion.

Chemical components: Fe, C, H, O

Solid

. 実験方法及び結果 (実験がうまくいかなかった場合、その理由を記述してください。)

Experimental method and results. If you failed to conduct experiment as planned, please describe reasons.

Sample preparation

Plates of normal steels and corrosion-resistant steels were prepared. These were coated with epoxy paints and scratched by the sharp-edged knife. And then they were subjected to cyclic corrosion test (CCT), to promote under-film corrosions, which repeated salt water spraying and drying process cyclically. List of samples are shown in a table.

Sample Name	Normal/Alloy	CCT days (4cycle/day)	Size
F5	Normal	0 day	18*70.5*6mm^3
F1		19 day	24.6*70.5*6.5
F2		30 day	
F3		46 day	
G3	Alloy	46 day	
S18	Normal	6 month	70*140*6
E16	Alloy		

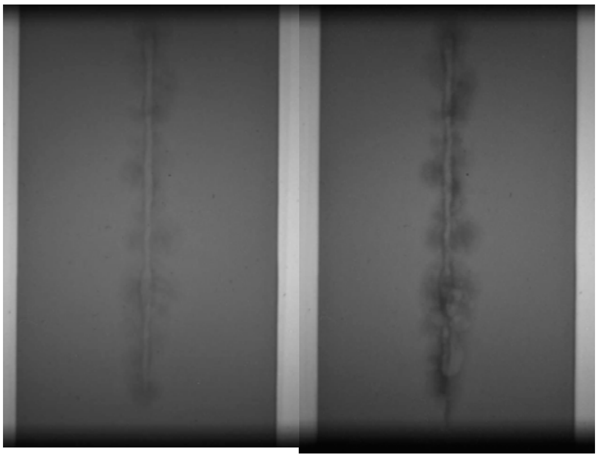
2. 実験方法及び結果（つづき） Experimental method and results (continued)

The samples were dried in the air environment. For the wet samples, they were soaked in the water until saturation, salvaged and then wiped the surface water.

Experimental setup

A top view of an experimental setup is shown. Top in the picture was upstream of the beam line. From the

upstream, a chamber box and a neutron cameras were settled. A sample was set in the chamber box. Neutron radiography images were taken by the neutron camera. For the computer tomography imaging, a rotation stage was equipped in the chamber box. For the dry process continuous imaging, the chamber box was used for the maintain sample environment with controlled humidity by flowing 2l/min dry air. Humidity and temperature in the chamber box were monitored continuously. The neutron camera was combination of a LiF/ZnS scintillator and a cooled CCD sensor. The neutron camera, rotation stage and beam monitoring devices were controlled together by single software in a PC.



Computer tomography Imaging. After drying or wetting, the sample was packed by thin polymer film to maintain dry or wet conditions. Neutron radiography images were taken with 360 * 1deg rotation step and 12 sec exposure time with 3 sec interval for the computer tomography. Images of the E16 sample are shown. Left is dry and right is wet. Neutrons exposed from the front of the sample. All seven samples were taken dry and wet images by same configuration. Texture of the dry image might be caused by hydrogen in the under-film corrosions. The difference between two images may indicate the water distribution.

Dry process continuous imaging. Samples were wetted by soaking in the water. The samples were set in the chamber box with dry air flow in order to maintain the controlled air environments. These images were taken continuously by 12 sec exposure time with 3 sec interval to observe the water movement in the under-film corrosion. F3, G3, E16, and S18 samples were measured by this method. Time decencies of the water distribution in 2D will be obtained.

Expected Result

Spatial and time resolutions of the images were enough high as expected. Even thin film for packing material was well imaged with 12 sec exposure time. By the quick analysis, waters in the regions which size were order of a few mm disappeared within several minutes. It could be caused by voids and defects in the under-film corrosions. The 3D images of the wet and dry will provide the information of the 3D distribution of the corrosions and the water. These will be analyzed with time dependency of 2D water distributions in order to understand the water behaviors in the under-film corrosions.