

# **Visualization of phase distribution in steel samples using neutron Bragg edge imaging**

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Neutron imaging has been widely used for non-destructive test and material study. Neutron imaging contrast is obtained using different neutron attenuation coefficient of various materials, and the principle of neutron imaging has similar to X-ray imaging. Neutron attenuation coefficient is also different in accordance with neutron wavelength although the same material is used for neutron imaging. In case of iron, Bragg edge region that neutron attenuation coefficient is dramatically changed is observed because of Bragg scattering, and Bragg edge spectrum shape is different in accordance with crystalline phase of iron. Therefore, phase distribution of BCC (Ferrite or Pearlite), BCT ( $\alpha$ -Martensite), and FCC (Austenite) structures in steel samples can be visualized using neutron Bragg edge imaging analysis. We have prepared 4 steel samples and carried out the neutron Bragg edge imaging experiments at Hokkaido University Neutron Source (HUNS) to investigate their crystalline phase property without destruction. First sample is steel ingot of sand iron by Korean traditional manufacturing method. Second sample is steel ingot with copper joint. Third sample is steel ingot using accumulative roll-bonding process. The last one is low transformation temperature welding sample. After neutron Bragg edge imaging analysis, it is confirmed that the steel ingot of sand iron has BCC structure. However, the steel ingot using accumulative roll-bonding process has BCT structure. The analysis results of prepared samples will be presented in detail.