

RIKEN accelerator-driven compact neutron source RANS and its practical applications with slow and fast neutrons

Yoshié OTAKE¹, Yoshichika Seki^{1,5}, Masato Takamura¹, Yoshimasa Ikeda¹, Atsushi Taketani¹, Masako Yamada¹, Sheng Wang^{1,2}, Hideyuki Sunaga¹, Masayoshi Kumagai³, Hiroshi Suzuki⁴

¹ *RIKEN Center for Advanced Photonics, RIKEN, Wako, Saitama, 351-0198, Japan*

² *Xi'an Jiao-tong University, Xi'an, China*

³ *Tokyo City University, Tokyo 158-8557, Japan*

⁴ *Japan Atomic Energy Agency, Ibaraki, 319-1112, Japan*

⁵ *The University of Tokyo, 113-0123, Japan*

RIKEN accelerator-driven compact neutron source (RANS) has operated since 2013 and has been proved its higher potential to be used on-site. RANS is one of the first compact neutron sources which is developed especially for such practical use as industrial use for development in the field of manufacturing, as non-destructive inspections on-site. The success of the visualization of the corrosion with wet-dry process under the film in the steel and alloy samples with RANS has clarified high potential of compact neutron source for metal and steel samples. The 3D distribution of the water and the corrosion in the steel under the film was obtained. The texture change of the steel before and after deformation was observed by the neutron diffraction experiment with RANS using TOF measurements with 2D detector, and compared with X-ray diffraction results. The change of the pole figures before and after the compression process taken with RANS are also analyzed.

The transportable compact neutron source with the large area detector and the health diagnostic system of the infrastructure is now being developed. For the non-destructive inspection system on-site, new type of imaging detector especially for fast neutron are developed with the combination of plastic scintillator and Multi Pixel Photon Counter. One of the most important mission of our compact neutron source project is to realize the non-destructive inspection system for large scale infrastructures such as pre-stress concrete bridges. The difference of the number of the steel bars in the thick concrete slab are detected with fast neutrons of RANS. The further development plan will be also discussed.

