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Elemental analysis of thin films using total reflection neutron beam

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Taking advantage of neutron transmittance and sensitivity to light elements, the neutron reflectivity method can analyze the structure near the surface from the distribution of scattering length density in the depth direction. That is, the density distribution in the depth direction of the sample can be known, but the type of elements cannot be obtained. We applied an idea similar to the total reflection X-ray fluorescence method to the neutron reflectivity. We try to obtain the elemental information near the surface by detecting the gamma rays generated by the nuclear reaction between the sample and incident neutron during the reflectivity measurements. Since gamma rays obtained in this process have higher energy than fluorescent X-rays, even light elements existing in deeply buried interfaces can be detected. In order to demonstrate this method, a small reflectometer was installed at the neutron beamline BL10 at the J-PARC Materials and Life Science Experimental Facility. In this presentation, we will report the current state of development of such elemental analysis.