Cord-marked earthenware potteries are commonly seen in the early stage of the settled-lifestyle cultures in the world. In Japan, the potteries are called Jomon potteries, and the era is called Jomon era. The Jomon era is characterized by the fact that the society was maintained over 10,000, while other world began agriculture, created a disparity between upper and lower status and formed nations in the period. The styles of the Jomon potteries changed in the long period; some of them known with flames-shaped ornamentation have received high artistic recognition, and have been stimulating modern artists. Why did the Jomon era last so long? How have societies changed and people and materials exchanged over the past 10,000 years, and how has technology and art developed? We will challenge such questions using crystallographic techniques.

Jomon pottery is produced by open burning. Therefore, the uniformity of the sample is poor, less reliable, even with repeated measurements. On the other hand, since neutron diffraction has a large penetrating power, the volume to be measured at one time is large and the reproducibility is found to be high. Therefore, it is expected to obtain much reliable information for the possible place of production, firing temperature, burial conditions and the state of preservation. On the other hand, earthenware is a heterogeneous mixture of various minerals, so analysis is not easy. In our study, we accumulated over hundreds of neutron data as well as fluorescent X-ray analysis, mineralogical analysis by microscopy, and neutron diffraction of standard rocks. Quantitative analysis of mineral crystals in pottery was performed by comparing with neutron diffraction patterns.

Among the pottery materials measured so far, we report the preliminary results of the middle Jomon (5,000 years ago) pottery fragments obtained during excavations at the Ide Uenohara site in Naraha-cho, Fukushima conducted between from 2006 and 2007 by Kobayashi et al. This area has been inaccessible since the 2011 earthquake and the Fukushima Daiichi nuclear power plant accident. The plagioclase in the KEK93 pottery fragment is close to that in granodiorite (different from andesite, basalt and gabbro). The Abukuma Mountains area is presumed to be a strong candidate for raw material production. The pottery firing temperature was estimated by high-temperature neutron diffraction as well as preliminary X-ray measurements; high-temperature neutron experiments showed a change at about 600°, suggesting that the pottery was fired at a lower temperature than previously expected.