

Chemical Analysis of Rust on Japanese Smoked Roof Tiles using Soft X-Ray Spectroscopy

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We investigated the surface carbon films of Japanese smoked roof tile, “Ibushi-Kawara,” by soft x-ray spectroscopy using synchrotron radiation to understand their properties from a chemical-bonding point of view and to improve quality control [1-3]. In this study, we analyzed the rust that rarely forms on the carbon films. Figure 1(a) shows the Kawara sample piece with a rusted portion. Soft x-ray absorption measurements that cover the C K to Fe L absorption edges and mapping measurements of the absorption peaks were performed at beamline BL-6.3.2 of the Advanced Light Source (ALS). In the mapping measurements, the spot size of the incident beams at the sample position measured 40 micron^V x 350 micron^H. By comparing the absorption spectra of the rusted Kawara with various iron oxides, the chemical formula of the rust is confirmed to be Fe₂O₃. Figure 1(b) shows the mapping spectrum measured by monitoring the FeL absorption peak intensity. This shows that Fe₂O₃ gradually spreads from the upper point. Therefore, it is estimated that the rust forms by the oxidation of the iron in the basal sintered soil with water soaked through pinholes of the carbon films. Then the Fe₂O₃ can ooze to the surface through the pinholes.

[1] Y. Muramatsu *et al.*, Jpn. J. Appl. Phys., 42, 6551-6555 (2003).

[2] Y. Muramatsu *et al.*, Spectrochimica Acta B, 59, 1317-1322 (2004).

[3] Y. Muramatsu *et al.*, X-Ray Spectrometry (*in press*).

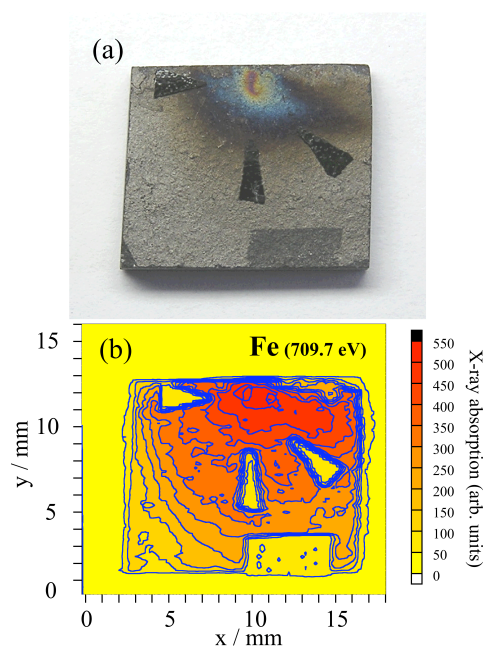


Fig. 1 Photograph of the rusted Kawara piece (a) and the mapping spectrum monitored FeL absorption peak (b).