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Raman microspectroscopic study of corroded bronze fragments from an Assyrian period tomb at Yasin Tepe, Iraqi Kurdistan and clayey volcanic products from the 7 March 2012 phreatic eruption on Ioto Island, Japan

Micro-Raman spectroscopy was used to identify mineral species in tiny bronze fragments from archaeological objects buried in an Assyrian period (10th-7th century BCE) tomb discovered at Yasin Tepe and mineral species in volcanic ash from the 7 March 2012 phreatic eruption at Old Crater on Ioto Island (Iwo-jima), Izu-Bonin arc, Japan. Five reference products of clay minerals, including kaolinite (JCSS1101b), dickite (JCSS1301), pyrophyllite (JCSS2101), montmorillonite (JCSS3101), and saponite (JCSS3501) were also analyzed to optimize analytical conditions and to obtain reference spectra.
Alteration minerals (malachite, azurite, and langite) and metal parts were identified with Raman analyses of the corroded bronze fragments. The absence of copper silicate minerals and soil minerals in the bronze fragments indicates that the samples have not been significantly weathered. These results are important for a better understanding of the condition and the past environment of the bronze samples. In addition, the information is helpful for evaluating the elemental and copper isotopic compositions of the original bronze artifacts [1].
Micro-Raman results revealed the presence of dickite, montmorillonite, gypsum, pyrite, marcasite, quartz, and anatase in the volcanic ash sample from the phreatic eruption. These alteration minerals were likely derived from the acidic alteration zone (150–190 °C) below the crater on Ioto Island. Marcasite, quartz, and anatase in aliquots of the sample were not detected by a previous powder X-ray diffraction study. Thus, these results demonstrate that Raman microspectroscopy is a more sensitive technique for identifying and characterizing alteration minerals in the volcanic products [2].

References

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