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A study on the characteristics of the excavated pottery in Hanseong and Sabi periods of the Baekje Kingdom (South Korea): mineralogical, chemical and spectroscopic analysis

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Abstract

The study analyzes the black color factors of black-burnished pottery excavated from the Punnap Fortress and the Seokchon Tomb during the Hanseong period of the Baekje Kingdom. The current hypothesis surrounding the pottery's black color factors suggests the use of magnetite, manganese oxide, and carbon. To compare the results of the black pottery, red pottery was used as the control group. To identify these black color factors, each hypothesis was investigated using several spectroscopic techniques. However, it was difficult to detect sufficient magnetite and manganese oxide on the surface of the black pottery to account for its black color. In contrast, a larger amount of carbon was located on the surface and core of the black pottery compared to the red pottery. These results indicate that the black factors can be credibly attributed to carbon rather than to magnetite or manganese oxide. The firing temperature of the black-burnished pottery was estimated from the mineral composition based on X-ray diffraction, and the firing atmosphere was deduced from the redox conditions based on the reduction index from Mössbauer spectroscopy. In addition, seven pieces of pottery excavated from Gunsu-ri Temple Site and Buyeo Ancient Tomb from the Sabi period of Baekje were investigated and compared the five pieces of pottery from the Hanseong period. Although the results were based on a limited number of potteries, various firing temperatures and redox atmosphere for pottery from the Hanseong and Sabi periods were carefully proposed.

Keywords Black-burnished pottery, Ceramic, Iron oxide, Amorphous carbon, Mössbauer spectroscopy