PIXE analysis of dyes used in traditional Japanese carpets (NABESHIMA-DANTSU)

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Abstract

NABESHIMA-DANTSU is the name of the first Japanese-made carpets which have been produced in the Nabeshima domain (Saga Prefecture) since the later Edo period. The NABESHIMA -DANTSU carpets have been woven from one kind of cotton, and have been dyed with various dyes and color fixatives. We analyzed pieces of the NABESHIMA-DANTSU carpets stored in the Saga Prefectural Museum and the Saga Prefectural Art Museum, by using PIXE method in order to detect dyeing methods used in them. We also analyzed dyes, color fixatives and cotton used in the traditional Japanese dyeing method. From the NABESHIMA-DANTSU carpets, small amounts of dyed and non-dyed samples were picked up and were analyzed by in-air PIXE system at Tohoku University. It was found that Fe and Cu are related to the parts dyed orange, and Al is related to the parts dyed green. The analysis of cotton dyed by the traditional Japanese method shows the similar results. It means that both colors in the NABESHIMA-DANTSU carpets were dyed by the traditional Japanese method which uses natural dyes. From literature documentation, it is considered that synthetic dyes were mainly used during the Taisho era. The present result shows that natural dyes might have been used in the Taisho era. In this research the PIXE method has proved to be very effective for the analysis of dyeing methods.