

Scientific Analysis of Pigments and Paper of the Sanskrit Sutras and Indian Medical Book from Nepal

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At the beginning of the 19th century, several Buddhist's texts written in Sanskrit were found in Nepal. Some of them were really rediscovered texts of missing Sanskrit Sutras considered to be the source book of the Chinese translation. Since the first discovery of those texts in 1826, intensive studies have been done by European and Japanese scholars mainly on philological studies. The paper used for the text was the palm-leaf style paper of typical Nepali hand made paper. From the point of view of paper conservation, the paper of those texts is quite attractive specimen because it is the concrete example of paper made by Central Asian traditional paper making technique. No systematic study, however, has been done on the paper specimens of those Sanskrit texts until now. It is the purpose of the present report to show the results of our recent studies on the analysis of pigments coated on the paper surface and the basic physical quantities of paper which classify the paper quality. The Sanskrit texts which we studied were a Mahāyānasūtrālamkāra(大乘莊嚴經論) text, three Sukhāvāṭīvyūha (佛說無量壽經)texts, and the Indian medical book Rogaviniçcaya, all were brought from Nepal in early 1900s and then owned by the Library of Ryukoku University.

All text pages were coloured by yellow on their back side. First we analyzed elements of pigment by X-ray fluorescent analysis and found that the main elements of yellow pigment are As, S and Ca. except the one text of Sukhāvāṭīvyūha coloured by the modern European invented chromium yellow. The existence of As and S suggests that the yellow pigment mainly consists of orpiment widely used in the central Asia to China. Excess S and Ca suggest that gypsum was also used for making pigment. The ratio between two main elements As/S is considered to be the important indicator to seek the origin of the texts. Really, it was found that the above ratios between two kinds of Sutras, Mahāyānasūtrālamkāra and two of three of texts Sukhāvāṭīvyūha were different. This result supports the previous philological study in which the difference in the origin between Mahāyānasūtrālamkāra text and Sukhāvāṭīvyūha texts was suggested.

Measurements of physical quantities of paper, size, area, thickness, weight, density, basis weight (weight per unit area) were carried out to enquire the paper making techniques. Larger value of basis weight of all five texts from 103 to 124g/m² compared to the value 70g/m² for contemporary copy paper or 50g/m² for present hand made Japanese paper suggests that thick and heavy paper was used in Nepal to obtain non-transparent paper without or less using filler. It was found that in some places of the paper examined in the present study were separated to two or three sheets. This implies that not a single leaf but stacked paper was used to obtain thicker paper. The standard deviation and the mean error value of quantities of the Indian medical book were found to be larger than those of all sacred manuscripts. This result shows that the paper used for Sutras was carefully prepared compared to the one for the ordinary use.