SEM-EDX analysis of blue and green pigments used in nineteenth-century China trade paintings

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Introduction
China trade painting, also known as Chinese export painting, is the genre of paintings produced throughout the eighteenth- and nineteenth-century, in the seaport cities in China and Macau (then a Portuguese colony) painted by local artists. These paintings were produced and sold as popular souvenirs to Western merchants and travellers prior to the arrival of photography. China trade paintings adapted to Western artistic conventions and easel painting techniques to appeal to the Western market, this could be reflected from the photographic quality of the images they depicted, treatment of perspective, light and shade, as well as the use of a wide range of vivid pigments and colourants.

Methodology & Results

Microscopical Identification of Pigment
Optical microscopy was used to study the Meltmount® (refractive index, R.I. 1.662) mounted powder pigments extracted from the respective paint samples. Under a polarizing optical microscope (Olympus BX60) each powder pigment slide was observed in transmitted light and cross-polarized light to study its optical characteristics (Fig. 7-9). Observations were then compared with the characteristics of the potential blue and green pigments that were available in nineteenth-century China.

Collectively for all three powder pigment samples, the bulk of the sample consisted of fine <1µm, rounded particles of a dull grey-green colour, exhibiting optical characteristics of green earth. In various proportions, traces of dark, smeared likely Prussian blue, green with blush undertone of medium sized ~2.5µm, irregularly shaped, fractured particles of malachite and dark yellow ~4-6µm medium sized, irregularly shaped, fractured particles of orpiment were observed.

Findings

Results indicate the presence of the following pigments: green earth, malachite, a copper-arsenic green likely emerald green, Prussian blue and orpiment, out of which three are pure greens. It would seem the Chinese artists preferred to work with pure green pigments then adjusting the hue with traces of blues and yellows. This may be an influence from their experience in colour mixing theories from Chinese brush painting techniques (Wang, 1679-1701), further the long tradition of employing various grades (particle sizes) of malachite, which effectively altered the various dark to light shades of green avoided the need for mixing.

Research Aim
To investigate the materials that were used for their construction, in particular identifying the blue and green pigments that were often applied in maritime themed China trade paintings produced in oils. Findings could provide an insight on the common blues and greens in the local painters’ palettes and make recommendations for the conservation treatment of these paintings, their long-term storage and display needs.

A selection of three China trade paintings dating from the nineteenth-century from the Hong Kong Museum of Art Collection were identified as suitable candidates for the purpose of this study (Fig. 1-3).

Methodology & Results

Based on the available resources and schedule for this project, optical microscopy was chosen as the primary pigment identification analytical technique further supported by elemental analysis from Scanning Electron Microscopy – Electron Dispersive X-ray analysis (SEM-EDX). Representative blue/green paint samples were collected from each study painting (Fig. 4-6).

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