
The color of the stained glasses of the Reims Cathedral : a witness of Middle Age technologies

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Abstract

We present spectroscopic and colorimetric data on stained glasses from the Cathedral of Reims (France), among the first French monuments registered as a UNESCO World Heritage Site. This investigation has taken advantage of the restoration of the Grande Rose window (built around 1275) on the western facade. Due to previous restorations over the past centuries, the western rose contains stained-glass pieces of a large variety of colors and periods (mainly from 13th, 16th and 20th century).

We have performed a systematic spectrometric and colorimetric analysis on the stained glasses just after their restoration, and we have used contactless devices, for allowing in situ measurements. Indeed, the analysis of historical stained glass windows has to follow standards of ethics, using only non-destructive and non-invasive techniques. For that purpose, a homemade portable UV-visible-NIR transmission spectrometer has been designed to investigate cultural heritage artifacts as historical glasses (Hunault et al, *Appl. Spectr.* 70, 778). We also systematically measured glass thicknesses, which evidenced variation of thickness depending on color. We wonder whether these differences were intentional or if different colors were produced by different glassmakers.

The assignment of the absorption bands and their relative intensity provide unique information about this glass, with special attention to the evolution of glass-making techniques and to the mastering of glass coloring. A particular attention was paid to the dispersion of the colorimetric parameters, because of the symbolic significance of most colors. The influence of the successive restoration periods was also systematically investigated.

This spectroscopic approach allows us to follow the evolution of color with the successive glassmaking techniques and glass formulation recipes. In our case, we observed that modern glassmakers produce glass with colors that very close from the medieval glasses, making impossible authentication on the sole color criterion, except in the case of chromium colored glasses, for which we show the effort of glassmakers to adapt their compositions and glass-making to obtain a color similar to that of medieval glasses.

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