

MICROANALYSIS CHARACTERIZATION OF ANCIENT STAINED GLASSES

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The scanning electron microscopy (SEM) technique combined with an EDXRS system has been applied to the study of ancient glasses, to determine whether repairs have been carried out or substitutions made of damaged parts [1]. In this work, we exploit image processing technique in order to enhance the SEM digital image, to improve its readability and, therefore, the identification of significant details and microscopic structure as well as to elucidate the execution technique and the use of pigments. We investigated some frescoes and stained glasses of XIV-XV centuries in the Basilica of St. Petronio in Bologna; further results have been obtained in the analysis of glass manufacture and conservation of the stained glasses in Duomo of Siena, made by Duccio di Boninsegna, representing the very first object of this kind produced in Italy.

By the XII century, in fact, complex techniques of stained glass manufacture had evolved and the essential methods have been remained more or less unaltered for quite long times. In many cases, the glass has been destroyed or replaced by other similar or white pieces. Therefore, it is often difficult to identify original or substituted stained glasses and determine the elemental composition for restoration and conservation aims. In St. Petronio's Basilica, the stained glasses have been extensively restored in 1879, but there are very few recorded items about that intervention and it is difficult to discriminate between original ancient and more recent substituted parts [2].

In our investigation, we make use of the advanced technologies available in our laboratories to afford this problem of primary interest for both the art historian and the conservator. The image processing algorithms allow a significant improvement of the quality of the microscopic images, once combined with SEM and optical microscopes, thus getting interesting information about composition, origin and datation of the investigated works of art. Moreover, new results can be added to the studies about elemental composition, manufacturing and conservation of Medieval to Renaissance stained glasses in Italy, where, differently from other European countries, this kind of investigation as well as experimental findings are still scarce, while the present work can contribute significantly to the establishment of a multimedia database on the material composition and the execution techniques of stained glasses of historical relevance.

REFERENCES

1. I. Freestone, *Looking into Glass*, in *Science and the Past*, S. Bowman, ed., British Museum Press, London, 1991.
2. G. Marchini, *Le vetrate*, in *La Basilica di San Petronio*, vol.I, Amilcare Pizzi, Milan, 1983, pp.295-308.