

THE CHALLENGES OF XRF ANALYSIS OF CULTURAL HERITAGE GLASS OBJECTS

The Corning Glass Museum has been using XRF and watching its development over the course of about 40 years. Like all other analytical techniques it has its advantages and disadvantages for the analysis of glass objects, artifacts and antiquities. The earlier lab based xrf systems allowed for destructive analysis of shards or of material that had been "prepared" for analysis by homogenizing the samples. For xrf analysis sampling and homogenization of the sample still is the only way to get fail safe accurate elemental analysis of glass. Unfortunately this technique just cannot be used on most important glass objects because destructive analysis is absolutely not acceptable. With the advent of the x-ray tube hand held system, with laboratory based capabilities, non destructive, non sampling, no effect on the object xrf analysis became possible. But great care must be used when using xrf of any type on unprepared samples. The physics of xrf analysis is dependent on; the inverse square of the distance to the element, exponentially relative to matrix density, exponentially relative to elemental X ray energy emission, exponentially relative to element location in the sample matrix, exponentially relative to beam filtering and energy and X ray beam distribution. Thus, if you do not have perfect sample uniformity, analysis by any xrf system must be treated with great care. For three years Corning glass museum and the scientists at Bruker Elemental have been developing and studying the best methods, techniques, and strengths and weakness of the application of x-ray tube hand held xrf system with laboratory based capabilities to the analysis of a broad array of glass objects at the Corning Glass museum. The results of this study and what can be determined and what cannot be determined because of the limit of the physics will be discussed.