

# Investigations of the elemental evidences in Art and Archaeology with the X-ray Fluorescence Microscopy at APS

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The Synchrotron Radiation X-ray Fluorescence Microscopy (XFM) is an indispensable non-destructive method to study the material elemental information. High energy X-ray beam is used to excite the inner shell electron, leaving a vacancy in the atomic structure. To stabilize the atom, an outer shell electron will fill in the vacancy and emit an X-ray photon with a characteristic energy respectively to the element species. Therefore, by detecting energy and the intensity of the emitted X-ray photons, one can identify and quantify the elements in the materials. XFM has high sensitivity and it is well-suited to study trace elements. XFM is a scanning probe technique. The sample is illuminated with an X-ray beam, which an energy dispersive detector is located perpendicular to the X-ray beam direction to measure a full spectrum to resolve the elemental information within the sample illumination volume. While the sample is raster-scanned, one can retrieve the 2D projective elemental information in the material. Combining the raster-scanning strategy with the computerized- tomography, one can probe 3D elemental information. The confocal XFM is another approach to study elemental information in 3D fashion. In this presentation, I will share the current XFM beamline capabilities and demonstrate with a few case studies of XFM application in the Art and Archaeology that are currently ongoing in the Microscopy Group in the Advanced Photon Source, Argonne National Laboratory.