

Comparing X-ray Computed Tomography Images of Corroded Coins with the Results from Traditional Cleaning

Abstract!

Traditional methods of cleaning corroded metal artifacts involves the physical removal of corrosion products, which can cause damage to the highly mineralized original surface. It is believed that X-ray computed tomography (XCT), a non-destructive imaging technique could provide images which would be as identifiable or more so than the results from mechanical cleaning methods. This technique was used to study Greco-Roman coins from the Diniacopoulos Collection at Queen's University, a collection jointly held by the Art Conservation Program and Department of Classics. A CT scan is conducted by acquiring a series of two-dimensional x-ray projection images captured at different rotation angles (Figure 1). Copper alloy sample coins were created to determine how the alloy content affected the XCT imaging process. The cleaned Diniacopoulos coins and the sample coins were digitally photographed and compared to the XCT scans.

Experimental!

!Sample coins of three different copper alloys; pure copper, low lead content, and high lead content were produced in the Mechanical Engineering Department using a coin press (Figure 2).

!The sample coins were force corroded through electrochemical means by wrapping each coin and a graphite electrode in copper wire, burying both in potting soil mixed with 100mL of 3.5% salt water and allowing 1.5 volts to run through the system.

!XCT images sample and Diniacopoulos coins were acquired using an Xradia MicroCT-400 (Figure 3)

!Both sample and Diniacopoulos coins were cleaned using mechanical methods with a No. 15 Feather scalpel, pin tool and ethanol.