

NON-DESTRUCTIVE EVALUATION OF ROMAN COIN PATINA'S FROM THE 3RD AND 4TH CENTURY

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ABSTRACT

Roman bronze coins from the 3rd and 4th century AD exhibit a wide variety of chemistries on their surfaces. This variation has been attributed to the variable methods used to produce the coins, the large number of mints producing bronze currency, and the periods of currency devaluation within the Roman Empire. Beside the base bronze metallurgy (Cu,Sn), Ag, Pb and Zn were frequently used as coinage metals. Silver coatings were often applied to increase the apparent value of the coins. Over the centuries these surfaces corroded producing a range of patinas. Non-destructive X-ray diffraction (XRD) and X-ray fluorescence (XRF) methods were used to evaluate ancient bronze coins. These methods are limited by their half depth of penetration into the coins, so the focus was on the chemistry of the patina's and how they related to the current appearance. Several third century bronze coins exhibited a very dark patina that was often composed of CuCl, Cu₂O (cuprite) and several forms of copper hydroxyl chloride, resulting from surface deterioration caused by corrosion and is often referred to as bronze disease. Coins of the latter 3rd century and 4th century often exhibit patinas that are corrosion products of lead, silver and tin, as lead and tin preferentially oxidize relative to the bronze alloys.

