

POSITIVE MATERIAL IDENTIFICATION

IMR Report Number 201602910

November 15th, 2016

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Date Received

November 7th, 2016

Description

Silver Tetradrachm
Silver Denarius "Mars"
Silver Denarius "Nike"
#1 Aurelian & Vabalathus
#2 Aurelian
#3 Probus
#4 Maximian

SUMMARY

Seven Roman Era coins were received for Positive Material Identification. The results are listed on the following pages. Note, these samples do not meet any specific alloy type.

Positive Material Identification (PMI) is an alloy verification technique, where analytical results are not certified, but are sufficient to identify a material or otherwise distinguish one material from another, especially when standards are unavailable. Due to the potential for alloy segregation, and the limited array of analysis techniques, there are accuracy limitations during PMI testing when compared to destructive full quantitative analysis. Accordingly, IMR follows a customer specified standard which requires that major elements be within +/- 10% of the specified range, minimum, or maximum for PMI testing.

ANALYTICAL PROCEDURES & TEST EQUIPMENT

I. Approximate Chemical Analysis

A. X-Ray Fluorescence Spectrometry, ASTM E1916-11



Reviewed by

Brian Herndon
Chemistry Technician

Reviewed by

Brett A. Miller, P.E., FASM
Technical Director

All procedures were performed in accordance with the IMR Quality Manual, current revision, and related procedures; and the PWA MCL Manual F 23 and related procedures. The information contained in this test report represents only the material tested and may not be reproduced, except in full, without the written approval of IMR Test Labs ("IMR"). IMR maintains a quality system in compliance with the ISO/IEC 17025 and is accredited by the American Association for Laboratory Accreditation (A2LA), certificates #1140.03 and #1140.04. IMR will perform all testing in good faith using the proper procedures, trained personnel, and equipment to accomplish the testing required. IMR's liability to the customer or any third party is limited at all times to the amount charged for the services provided. All samples will be retained for a minimum of 6 months and may be destroyed thereafter unless otherwise specified by the customer. The recording of false, fictitious, or fraudulent statements or entries on this document may be punished as a felony under federal statutes. IMR Test Labs is a GEAE S-400 approved lab (Supplier Code T9334).

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TABLE 1
RESULTS OF XRF CHEMICAL ANALYSIS

Element	Silver Tetradrachm AD 111	Silver Denarius; Mars	Silver Denarius; Nike
Silver	79.04	95.13	95.31
Copper	14.99	2.36	3.12
Tin	2.92	0.42	----
Lead	2.02	1.90	1.02
Gold	0.45	0.35	0.38
Iron	0.34	----	----
Chromium	0.03	0.03	0.03
Nickel	0.02	0.02	0.02
Zinc	0.03	0.01	----
Bismuth	0.05	0.08	----
Vanadium	0.03	----	----
Cobalt	----	0.01	----
Molybdenum	----	0.03	----

*Results in weight percent

METHODS

X-Ray Fluorescence Spectrometry, ASTM E1916-11

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TABLE 2
RESULTS OF XRF CHEMICAL ANALYSIS

Element	#1 Aurelian & Vabalathus	#2 Aurelian	#3 Probus	#4 Maximian
Copper	90.29	91.21	87.85	68.64
Lead	2.19	1.58	2.41	24.14
Tin	2.84	2.57	6.75	5.82
Silver	2.09	2.03	0.07	0.09
Silicon	1.55	1.97	1.99	0.87
Iron	0.02	----	0.03	----
Arsenic	0.19	0.11	0.06	----
Nickel	0.05	0.09	0.05	----
Zinc	0.51	0.05	0.35	0.26
Bismuth	----	0.03	----	----
Antimony	----	0.14	0.18	0.19
Cobalt	0.01	0.02	0.01	0.04
Aluminum	0.25	0.30	0.24	----
Phosphorus	----	0.03	0.05	----
Sulfur	0.07	0.05	0.06	----
Zirconium	----	----	----	0.03

*Results in weight percent

METHODS

X-Ray Fluorescence Spectrometry, ASTM E1916-11