

National Bureau of Standards

Certificate

Standard Reference Material 2350

Nickel Step Test Standard

for Electrochemical Potential and Thickness Measurements

This Standard Reference Material (SRM) is intended to be used primarily to determine the reliability of step test measurements of electrochemical potential and thickness of multilayered nickel deposits¹. It consists of a 50 x 50 mm plate cut from a sheet of copper plated steel over which a duplex nickel coating has been deposited. The duplex nickel is about 7 μm of bright nickel over about 20 μm of semibright nickel (See Figure 1). The step test potential of SRM 2350 is between 110 and 150 mV.

The certified step test potential and total nickel thickness for this SRM were determined at the center of the SRM. These values are within 10 mV for potential and 3 μm for total thickness. The values of potential difference (step) and thickness were determined using Harbulak's method¹.

The potential versus thickness trace, taken at the center of the SRM, is attached as Figure 2.

The step potential is the difference between the potential of the bright nickel and that of the semibright nickel. The vertical lines crossing the trace indicate where the potential and thickness measurements were made. As recorded on this trace, the potential of the bright nickel was measured (first vertical line from left) about 2 μm left of the beginning of the break between the two layers (second vertical line); the semibright was measured (third vertical line) about 2 μm right of the break. The trace approaches the potential of the copper at the extreme right (fourth vertical line).

Thickness was determined using Faraday's law for each SRM and was confirmed microscopically on a single SRM from the same sheet.

Certified Values

Serial No.	_____
Step Test Potential	_____
Bright Nickel Thickness	_____
Semibright Nickel Thickness	_____
Total Nickel Thickness	_____

SRM 2350 was fabricated and calibrated in the NBS Metallurgy Division's Electrodeposition group by H.J. Brown and D. Kelley.

The technical effort leading to certification of this Standard Reference Material was directed by D.S. Lashmore and F. Ogburn.

The issuance of this SRM was coordinated through the Office of Standard Reference Materials by R.W. Seward.

Gaithersburg, MD 20899
August 8, 1985

Stanley D. Rasberry, Chief
Office of Standard Reference Materials

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The dissolution parameters used were:

Current:	(35.0 mA)
Diameter:	(0.34 – 0.36 cm ^a)
Electrolyte:	
NiCl ₂ ·6H ₂ O	(300 g/L)
NaCl	(50 g/L)
H ₂ BO ₃	(25 g/L)
pH	(3)
Reference Electrode:	Ag/AgCl

1. E.P. Harbulak, *Plating and Surface Finishing*, 67, No. 2, 49-56 (1980).

*Values in parentheses are not certified, but are provided for information only.

^aThe measured diameter was determined to be within this range.

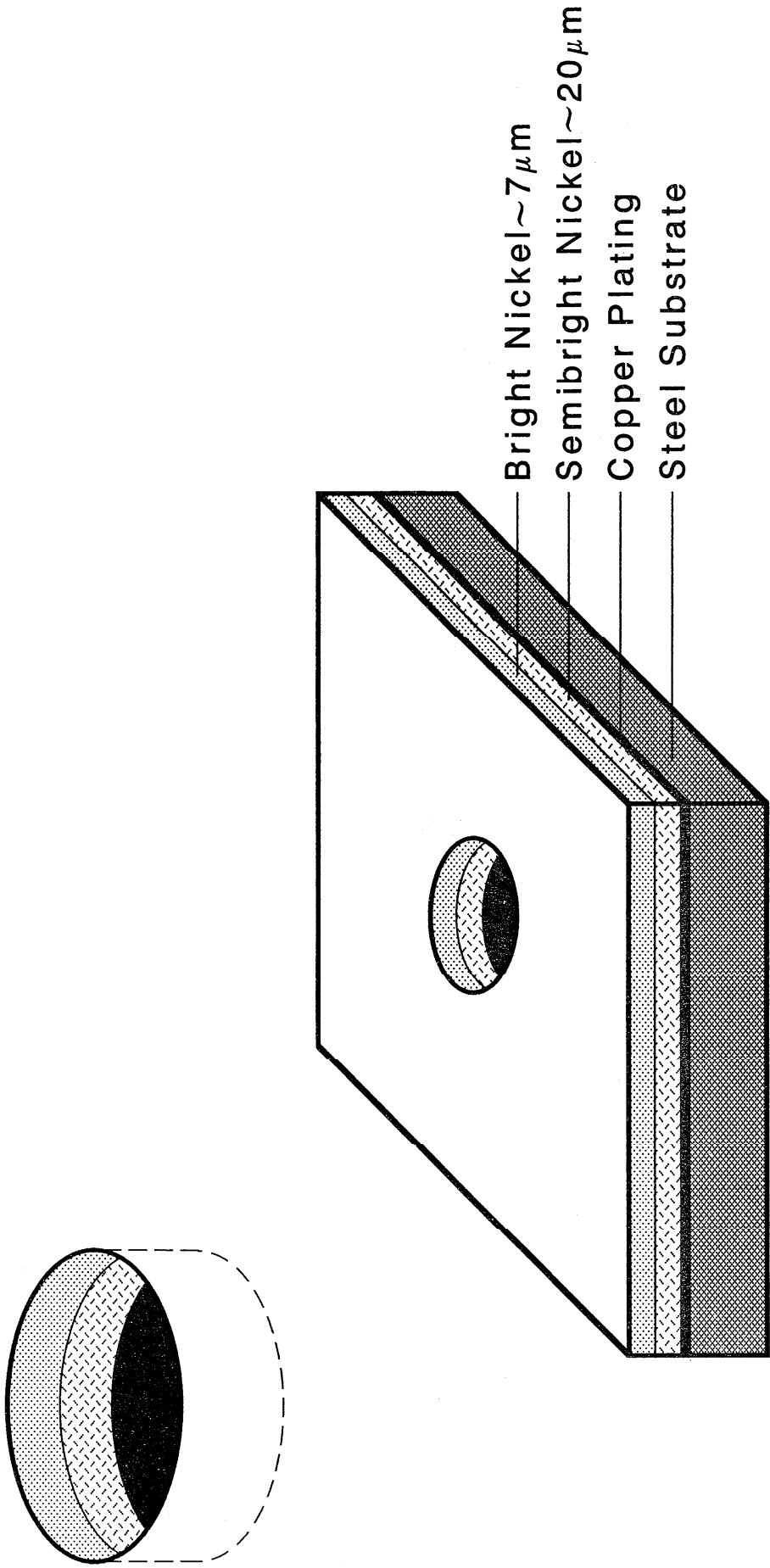


Figure 1. SRM 2350 consists of two layers of nickel deposited on a copper plated steel substrate.