

Procedure for the Preparation of Foils for Physical Analysis

The following procedure is recommended for preparing foils of metal electrodeposits intended for internal stress and ductility measurement via uniaxial pull testing. This procedure is most commonly used to prepare test specimens of electrodeposited copper and nickel and may be used as is or adapted for other metallic deposits or test methods.

1. Soak the 3.1 x 9.5 inch stainless steel mandrel* in fresh 50 % Nitric Acid solution for at least two hours.
2. Take stainless steel out and rinse well with D. I water
3. Wearing gloves, to avoid finger prints, cover the back of 3.1 x 9.5 inch stainless steel mandrel with platers tape leaving about .5 inches clear at the top edge to be used as connection when plating.
4. On the front of 3.1 x 9.5 inch stainless steel, tape the three edges (about 0.25 inch) to prevent the deposit from wrapping around the edges. Do not cover the top edge.
5. Bag the anode by using woven polypropylene or Whatman filter paper # 541 (185 mm diameter).
6. Pour one gallon of plating solution in a 4000 ml beaker and heat it to 125 °F (for nickel, other applications per recommended operating temperature) on a hot plate with stirrer on.
7. Clamp an anode to a side of a beaker and to the opposite side clamp the front of 3.1 x 9.5 inch taped stainless steel mandrel facing the anode.
8. Clip the negative lead to the stainless steel mandrel and the positive lead to the anode.
9. Turn the rectifier on and plate at 1.25 A (20 ASF), for two hours for a deposit of 0.002" minimum thickness.
10. After plating, remove the tape and carefully lift one corner of the nickel deposit with a sharp knife blade.
11. Pull the foil carefully without severely bending or creasing it.
12. With a micrometer measure the thickness of the foil to verify the thickness 0.002 +/- 0.0005 inches.
13. Place the foil on a light table or hold it to a strong back light to verify it is free of pinholes. Insufficient thickness or the presence of pinholes will be cause for sample rejection.
14. Store and ship the properly prepared foils between two layers of stiff cardboard to avoid shipping and handling defects, i.e. folds or creases.

Note: 304 Stainless Steel is recommended – Pumice scrub the mandrel prior to first use with soft scrub brush. Alkaline clean the mandrel to a water break free surface before the nitric acid passivation. For Inconel or nickel mandrels, proper passivation preparation is immersion in 1g/l of freshly prepared Potassium Dichromate solution for 2 hours.