The Institute for Interconnecting and Packaging Electronic Circuits
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IPC-TM-650
TEST METHODS MANUAL

Number	
2.3.21	
Subject	
Plating Quality Hull Cell Method	
Date	Revision
8/97	**A**
Originating Task Group	
N/A	

1.0 Scope

1.1 The Hull Cell is a miniature plating unit designed to produce cathode deposits on a panel that correlates the characteristics of the plating unit being evaluated. Interpretation of the ''as plated'' cathode panel give rapid information about brightness levels, irregular plate deposits, uniformity of deposits, coverage, throwing power, impurities, and plating bath chemistry.

1.2 Theory: Within the parameters of recommended operating characteristics of a particular plating solution, the HULL CELL will duplicate what is actually occurring in the plating unit proper.

Correlation of the ''as plated'' panel and the HULL CELL SCALE allows rapid, nondestructive testing of plating solutions for research, preventative maintenance, troubleshooting, and quality control.

2.0 Applicable Documents

R. O. Technical Bulletin No. 404
The Hull Cell, by Sedusky and Mohler

3.0 Test Specimen

3.1 Description of Specimen A representative sample from the plating unit to be evaluated is withdrawn and should be a composite sampling from various areas in the plating tank and from various depths within these areas.

3.2 Specimen Preparation The representative sample should be analyzed chemically for those critical components recommended by the supplier of the plating bath. Correlation of Hull Cell panels without the information on the bath chemistry can be very misleading.

3.3 Operating Conditions Particular attention shall be given to the physical conditions of the plating unit at the time of sampling and these operating conditions should be duplicated during Hull Cell testing. If this is not done, interpretation will be meaningless. Example: temperature, cathode agitation, air agitation.

4.0 Apparatus

4.1 Description of Equipment A bench or portable miniature plating cell is employed using the following components.

a. A rectifier (D.C. power source) with variable controls for amperage from 0-10 amps, 0-12 volts. This power source should have less than 5% ripple.

b. Hull Cell Anode ''+'' chemistry of the anode the same as is in the plating unit or as recommended by the chemical supplier. Example: zinc anode for zinc plating bath.

c. Color coded coated cables capable of carrying the current required with an alligator clip soldered to cell end. Color code recognized universally is as follows: anode ''+'' black; cathode ''–'' red.

d. Hull Cell Cathode Panels—two most widely used are zinc plated steel and thin plastic protected brass panels.

e. Hull Cell—with scribed solution level line, 267 ml, 524 ml, or 1000 ml size. The most commonly used size is the 267 ml. Hull Cells are available in Lucite, Polypropylene, and Porcelain.

f. Hull Cell Scale—a calibrated ruler for interpretation of 1, 2, 3, and 5 amp panels to determine current densities.

g. Hull Cell Agitator—optional motor driven arm and panel assembly for duplicating solution and/or cathode agitation.

h. Air Agitation Hull Cell—specially designed for introducing air into the miniature plating unit to duplicate air agitation operations.

i. Timer—separate or built into the DC power unit depending upon the sophistication desired.

5.0 Procedure

5.1 Preparation (It is recommended that panels be handled with tweezers and gloves to prevent misleading results.)

5.1.1 Pre-clean cathode test panel.

5.1.2 For zinc plated steel panels: immerse in 50% by volume C.P. Hydrochloric acid to strip off protective zinc film.

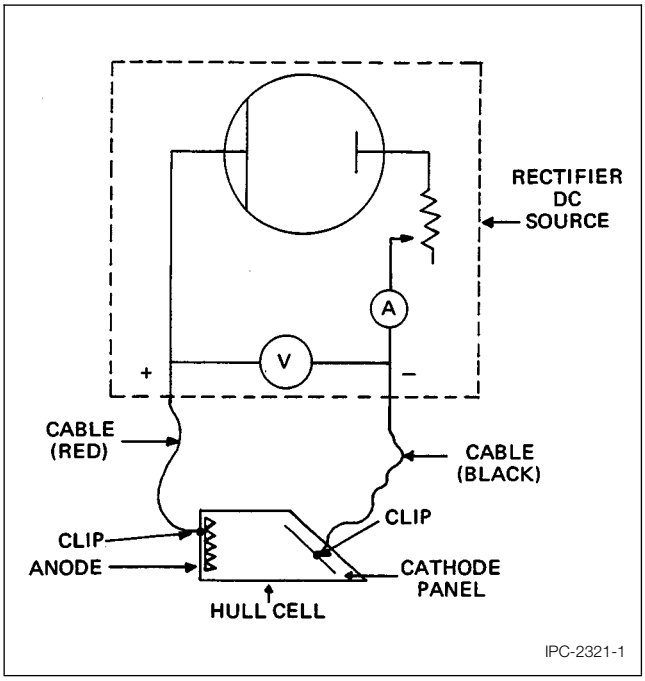

Figure 1 Hull Cell Hook Up

5.1.3 Cold water rinse.

5.1.4 Wipe surface with Hull Cell sponge that has been soaked in D.I. water.

5.1.5 Observe panel for water break free condition. Repeat 5.1.4 and 5.1.5 as necessary.

5.1.6 For plastic coated brass panels-remove plastic film by peeling it off.

5.1.7 Soak in mild soak cleaner.

5.1.8 Reserve current clean at 2 amps for one minute.

5.1.9 Cold water rinse.

5.1.10 Acid dip 10% C.P. Hydrochloric Acid for 5 seconds.

5.1.11 Cold water rinse.

5.1.12 Observe for water break free surface; repeat steps 5.1.7 through 5.2.11 if necessary.

5.2 Test Insert cathode test panel along the slanted side of the Hull Cell (it just fits), which has solution to scribed line.

5.2.1 Hook red cable to anode (+).

5.2.2 Hook black cable to cathode (–).

5.2.3 Set timer to prescribed time (see tech bulletin).

5.2.4 Turn on power source.

5.2.5 Adjust power to described amperage.

5.2.6 Start time.

5.2.7 At prescribed time, shut off power.

5.2.8 Disconnect cathode cable.

5.2.9 Remove cathode panel.

5.2.10 Cold water rinse.

5.2.11 Complete desired post plate treatment if any-example: dipping panel in 1/4 to 1/2 of 1% by volume. Nitric Acid (C.P. Grade) for 3-5 seconds enhances the ability to interpret the panel on zinc and cadmium plating solutions.

5.2.12 Warm Water Rinse.

5.2.13 Dry, forced air or even wiping with a water absorbent paper towel.

5.2.14 An alternate method of drying the panels is to water rinse followed by an alcohol rinse to drive off the water. Also, a method of preserving samples is to spray them immediately with a clear lacquer to prevent oxidation.

5.3 Evaluation

5.3.1 See Bulletin ''The Hull Cell'' or proprietors data sheets utilizing the Hull Cell Scale appropriate for the amperage used as the guide to current densities.

5.3.2 Hull Scale use: place the bottom edge of the ''as plated'' on the line that matches the amperage plating was performed. The areas on the panel above these numbers are the area of that number's current density.

6.0 *Notes*

6.1 Preventative Maintenance, Troubleshooting

6.1.1 Depending upon the bath chemistry as analyzed, condition of the panel relative to uniformity, burning, cloud patterns skip plate, etc., modification by controlled additions can be made to the Hull Cell plating solution and procedures can be repeated. Changes caused by addition to the Hull Cell will duplicate results to be expected by the same proportionate additions to the main plating bath.

6.1.2 Correlations of thickness checks in the controlled time, temperature, amperage cathode panel will also tell the optimum plating range to obtain plating thickness desired.

6.1.3 Source of applicable documents:

R.O. Hull and Co., Inc.
3203 W. 71st
Cleveland, OH 44102