BERKEM®
performance in plating

PROCESS TECHNICAL DATA SHEET

CATAFOR 400 *series*

CATAPHORETIC LACQUERS

Colours : **Various** Use : **Bath** Colors coordinates **: ND**

Product description

CATAFOR 400 is a water-soluble cataphoretic painting process able to deposits on any metallic substrate a transparent or coloured acrylic resin with good hardness and adhesion. CATAFOR 400 is characterised by high resistance to corrosion, solvents, water and products for domestic use and it is available in two types :

CATAFOR 400L (Low thickness deposition) and **CATAFOR 400H (High thickness deposition).** The main characteristics are :

- High brighteness and coverage
- Good resistance to perspiration
- High resistance to corrosion and UV rays
- High resistance to chemical agents and abrasion
- Low curing temperature
- For all metals

Application Fields

CATAFOR 400 can be applied on all metals inipendently by the field of use.

CATAFOR 400L is widely used in the Goldsmith and silversmith field where the thickness must be invisible and uniform on very difficult areas

CATAFOR 400H is widely used where an high wear resistance is requie like as fashion accessories. Furthermore is used n the fittings field.

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Product description

Techinical parameters / Operative conditions - CATAFOR 400L / CATAFOR 400H

Parameter	UM	Operative Range
Solids content on concentrated	%	42 - 44
Solids content of the solution	%	8 - 12
MEQ (at 10% of solid)	Un	35 - 55
Conductivity of solution	Micro Siemens	500 - 850
Voltage	V	25 – 100
Anode/Cathode Ratio		Min 1:5 / Max 1:1
Anodes		Stainless Steel AISI 316 (polished)
Minimum distance anode to cathode	mm	100
Temperature of solution	°C	23 - 28
Treatment time	Sec	10 - 120
Curing temperature	°C	120 - 140
Curing time	Min	20 - 40
Filtration		Necessary
Thickness	Micron	3 - 5 (CATAFOR 400L) 8 - 10 (CATAFOR 400H)
Perspiration resistance		Good
Acetone resistance		Good
Pencil hardness	H	4
Corrosion resistance (cass test)	h	200 - 1000 (in relation to the substrate)
Humid adhesion resistance	%	100
Dry adhesion resistance	%	100
Humidity test	h	More than 500 hours

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The Berkem Electrophoretic Coating Process

The Berkem Electrophoretic Process is a water-based system that uses electric current to deposit organic coatings on electrically conductive parts. The fundamental physical principle of electrophoretic coating is that materials with opposite electric charges attract. A low voltage electric current is passed through the coating bath to charge the organic particles. The charged organic particles are deposited on to the metal part forming an even continuous film. Once deposited the coating becomes insoluble in water and can be rinsed to remove any residues. After rinsing the coating is cured in an oven or stove to form a high performance organic coating.

Types of Electrophoretic Coating
Depending on the polarity of the charged particles, electrophoretic coating is classified as either Anodic or Cathodic deposition.

Anodic
In anodic electrophoretic coating, the part to be coated is the anode.

Cathodic
In cathodic electrophoretic coating, the part to be coated is the cathode.

Most of the Berkem range is cathodic type systems but we do offer anodic systems for special applications

Typical process sequence for cathodic coating of metal parts

1. Pre-treat or clean part
2. Rinse part with de-ionised water
3. LACQUER PROCESS
4. Rinse part in drag out rinse tank
5. Rinse part in one or more steps of deionised water
6. Rinse part in rinse aid (CATAFOR 400R)
7. Cure part in oven

1—Pre-treatment

The most important aspect of this stage is that the part or component to be coated is clean and free from dirt, pre-treatment chemical, oil or grease. The surface to be coated should have a clean water break free surface. The pre-treatment process can range from a simple degrease to a complex plating process. Contact Berkem for detailed recommendations on pre-treatment sequence for specific substrates and metals.

2—De-Ionised Water Rinse Pre Rinse

The purpose of this rinse is to protect the electrophoretic coating tank from contamination. This final stage of the pre-treatment process should always be a high quality demineralised water rinse. This is to prevent “carry over” of chemicals or contamination into the electrophoretic coating bath. “Carry over” can be just drips from the component parts or contaminants trapped in recess areas of components. **The maximum conductivity of the final rinse should be 50 micro Siemens When the maximum conductivity is reached the rinse needs to be dumped and refilled with high quality deionised water (conductivity less than 5 micro siemens)** .

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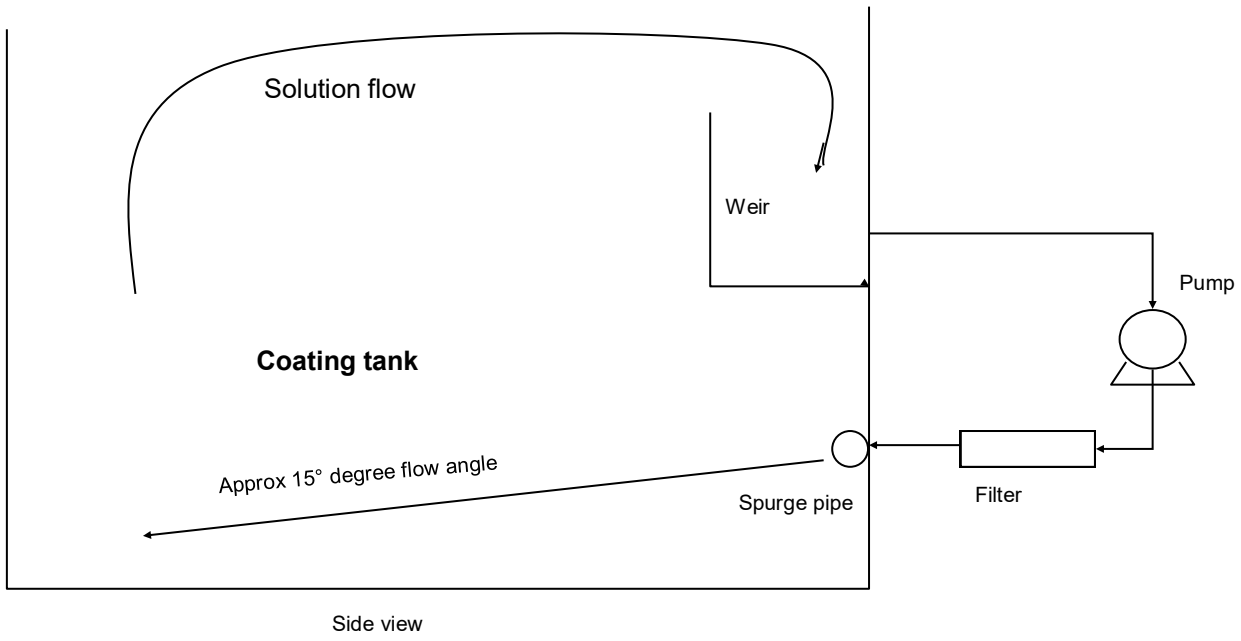
Equipment Required

a) Coating Tank
b) Circulation Pump
c) Stainless Steel Anodes
d) Filtration System
e) Rectifier
f) Ultrafiltration (raccomanded for volumes bigger than 150 liters)

EQUIPMENT CONSIDERATIONS

a) Coating Tank and pipe work material can be plastic such as polypropylene, PVC or nylon. Figure 1 Basic Coating Tank Design



Side view

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Design
Wide ranges of coating tank designs are possible depending on shape and size of parts to be coated. Solution return to the tank should be through a "sparge" pipe designed to give an even downward flow of approximately 15 degrees. A "sparge pipe" is a pipe with a series of holes to given constant and even flow across the full width of the coating tank.

b) Circulation
Working solution movement is important. It is best designed to give movement over a weir to with a slight cascade effect without excessive solution turbulence. Excessive turbulence can cause foam to form.

Pumps
Clear and dyed systems need 4 - 5 tank volumes turnover per hour
Pigmented and matt low gloss systems 8 - 10 volumes turnover per hour
Any seals used on circulation pumps should be Viton or Teflon PTFE type

Heating & Cooling Systems should be contained within the permeate rinse section or the weir compartment.

c) Anodes Grade 316 Stainless Steel (Polished) must be used

- Anode / Cathode Ratio 1:1 Nominal (dependent on application)
- The total area of the anodes should be about the same as the area of the components to be coated.
- Anode Cathode Distance 100 mm (Minimum)

d) Filtration

Closed Loop Purification (CLP) ion exchange should be fitted as part of the coating system for high quality requirements. In addition to CLP, separate 1mm absolute particle filtration is needed for high quality clear and dyed systems Pigmented processes should typically have 25 to 50 micron filtration depending on application.

e) Rectifier Constant volt and / or constant current power are required capable of delivering 30 - 150 volts depending on application. The current capacity will depend on the surface area to be coated. Under constant current conditions typical current densities of 0.05 – 0.16 A dm-2 are required

Coating Time Typically 20 to 180 seconds depending on application. Automatic timer recommended for consistent results

Bath Coating Temperature Typical working range 25+/- 2 degrees Celsius. Increase in temperature will increase film thickness (for a given voltage and time). A constant bath temperature is preferred to prevent variations in coating film thickness and appearance.

f) Ultrafiltration (U/F)
The output from an ultra filtration unit is called "permeate" and it is sometimes referred to as "ultrafiltrate" Ultrafiltration is used to purify the working solution and works in a similar way to dialysis in the human kidney. Ultrafiltration uses low pressure membrane filtration to separate small molecules from large molecules. The working solution polymer emulsion molecules are too large to pass through the semi permeable membrane and remain in suspension. Ionic contamination and low molecular weight water-soluble particles pass through the membrane as permeate.

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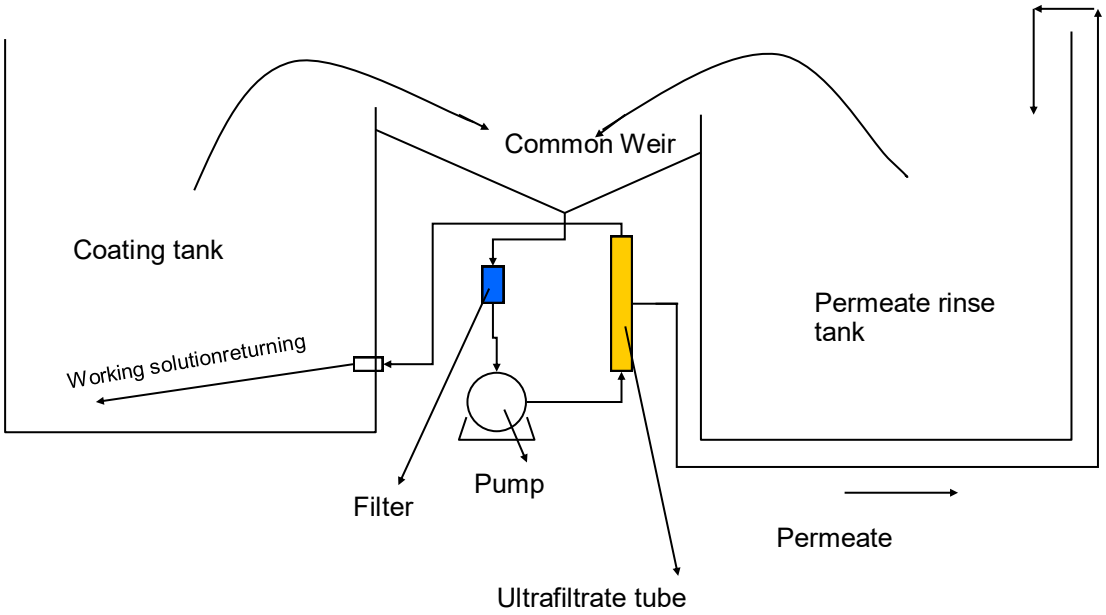
"Closed Loop" Systems



Solids from solution carry over and rinsing are re- claimed into coating tank giving up to 99% utilisation of coating solution.

Permeate Dumping
Permeate dumping is a procedure carried out to remove contamination from a coating bath solution. It removes ionic contamination and lowers coating solution conductivity. Permeate dumping is also used to reduce acid level when the MEQ is too high. If the coating bath solution is very contaminated permeate dumping procedure may have to be repeated several times before an improvement in coating appearance.

As a general rule it should be noted that:

- Dumping 1 tank volumes of permeate removes 50% of contamination
- Dumping 2 tank volumes of permeate removes 75% of contamination
- Dumping 3 tank volumes of permeate removes 90% of contamination

So for example a severely contaminated 100 Litre coating bath solution will need 200! Litres of permeate dumping to remove most of the contamination. For this reason it is best to avoid contaminating the bath whenever possible.

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Permeate Dumping

Permeate is often dumped by discarding the permeate rinse tank and replacing with an artificial U/F permeate solution. When dumping permeate it is important to replenish CATAFOR 400S1 solvent and CATAFOR 400PH stabiliser. One of the negative aspects of permeate dumping is that water soluble CATAFOR 400S1 solvent and CATAFOR 400PH stabiliser are removed from the system and need replacing. Replenishment is needed to keep the coating bath solution stable and in balance. Dumping permeate will lower the MEQ (acid value) .**Caution** If the bath MEQ drops below minimum value the coating bath solution can become unstable and cause U/F tubes to block.

Notes

After the dumping and replenishing procedure it is best to recheck MEQ value after 24 hours

Cathodic Artificial U/F Solution

- Addition Levels
- CATAFOR 400S1 Solvent Replenisher 3% of tank volume
- CATAFOR 400PH Stabiliser 0.5ml per litre of tank volume

Example 100 Litres Artificial U/F Solution

- 3 Liters of Solvent Replenisher CATAFOR 400S1
- 50ml CATAFOR 400PH Stabiliser
- 96.95 Litres Demineralised Water (Conductivity less than 10 micro Siemens)

4) Drag Out Rinse

In most installations this is the permeate rinse tank and part of the “closed loop” system. Coated components are dipped up and down several times in this rinse to thoroughly remove surface “cream coat” and excess material from components. The effectiveness of the rinsing is judged visually by making sure the surface is free from runs and water breaks. In low cost small installation (tank size typically under 100 litres) the rinse can be a deionised water rinse tank with 1ml/litre of CATAFOR 400R Rinse Aid added.

5) Rinse Aid Rinse

This is the final rinse before cure oven. It is made up with deionised water and 1ml/litre of CATAFOR 400R Rinse Aid. Coated components are dipped up and down several times in this rinse and then shaken to remove any excess. The rinsing is then is judged visually by making sure the surface is free from runs and water breaks before placing in oven.

6) Cure Oven

This is the part of the process that cures the coating and gives the coating its properties. It is important to make sure that the coating is cured fully without over curing. The cure process is a combination of temperature and time. Under cure will give soft-coated films with poor chemical and solvent resistance. Over cure will cause yellowing and sometime brittle films. There is a wide range of oven design options from simple box type to complex automatic conveyor systems. Product data sheets will specify the cure temperature and time required. Curing temperatures range from 120 to 180 degrees C depending on the product type.

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Oven Considerations

- Oven can be heated by gas or electricity
- The cure temperature needed is metal temperature so consideration should be given to longer heat up times for heavy components.
- Ovens should have adequate fume extraction and circulation.
- Fan assisted air circulation ovens give an even temperature distribution.
- Infra Red ovens are good for flat type parts or components
- Indirect gas fired ovens are better than direct gas fired ovens
- Direct gas fired ovens can give problems with some applications
- Ovens should be free from airborne dirt or contamination
- Circulating air stoving ovens should be externally vented. The oven input air should be filtered to prevent airborne particles and dust contaminating the coated components in the oven

MAKING UP A NEW COATING TANK

It is most important that the coating tank to be filled is very clean, free from dirt oil, or grease. Any associated tanks; pipe work or mixing equipment should also be very clean.

Note

If you are converting an existing electrophoretic tank please follow these steps. Residual contaminate from some systems can cause problems and a rigorous cleaning schedule is needed :

- Empty the old coating tank and fill up with deionised water switching on the circulating pump. Dump the tank.
- Remove carefully all the dried residues and cleand in the best possible way using ACETONE if required.
- Fill up the coating tank with a solution composed by CATAFOR 400S3 2-3% + CATAFOR 400PH 5% + DEIONISED WATER 92% and leave to circultaing for 24 h at 30°C. The same solution can be used to clean the ultrafiltrating membrane.
- Empty the tank after 24 h and refill with deionised water
- Empty the tank and fill up with deionised water in order to make up the new coating solution.

Make up 1/2

Calculate the amount of concentrate needed to give the required working solution solids content. If we need to make up 100 liters of coating at 10% dry solid starting from concentrated lacquer at 40% we need to apply the following math :

- (100 x 10) / 40 = 25 Kg of Concentrated CATAFOR 400L/H lacquer

New bath “Let Down” procedure

The “let down” procedure is the method for diluting the concentrate. To dilute the concentrate de-ionised water with conductivity less than 10 micro siemens is needed. It is best to premix the concentrate with de-ionised water in a separate clean container from the coating tank. With large tanks it may be necessary to do several manual let downs or use a pump with a powered or motorised slow speed stirrer With small coating tanks (less than 50 Litres) the coating tank can be used for let down operation.

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Procedure

1. Slowly add two parts de-ionised water to one part concentrate whilst continuously mixing with a flat bladed paddle.
2. Continue mixing for at least five minutes until a homogenous and uniform mixture is obtained.
3. Add a further 1 part de-ionised water and mix well.
4. Pour solution slowly into coating tank.
5. Repeat procedure until all concentrate is diluted
6. Add de-ionised water to give required tank volume
7. Allow working solution to circulate for 12 - 24 hours through a suitable filter system before use.

Notes:

Mixing Apparatus and Tanks Any material in contact with Berkem electrophoretic materials should be inert and non corrodible. Plastics such as polypropylene, PVC and nylon are suitable. **Only Grade 316 stainless steel is to be used for metal components.** Manual mixing with some form of flat bladed mixing implement is OK for small additions and will give adequate mixing. Large quantities of concentrate additions will need a powered or motorised slow speed stirrer

A "broom stick" IS NOT a suitable mixing implement

All mixing apparatus and measuring vessels used should be for Berkem process chemicals only. This is to prevent contamination from other process chemicals.

BATH MAINTENANCE

Bath maintenance consists of:

1. General Maintenance
2. Controlling Solids Content
3. Solvents Additions
4. Emulsion Stabiliser Additions
5. Ultrafiltrate Unit
6. Dye Solution Additions (if applicable)

1) General Maintenance

- Prevent Drag in (carry over) Coating pre-rinse tank (maximum conductivity 50 micro siemens) should be changed on a regular basis to prevent contamination of working solution
- Maintaining good jig tips and jig coatings. Old jig coatings tend to crack and peel back making traps for cleaners and plating solutions. These contaminates are then carried over into the working solution.
- Any fallen components or parts should be removed from the coating bath as soon as possible. If they are not removed they will slowly dissolve and contaminate the solution.
- Good electrical contact is required. Cathode bar and electrical contact points need to be cleaned on a regular basis.
- Deionised water. Always use good quality deionised water (less than 10 micro siemens)
- Working Solution Bath Parameters. Do regular tests on solids, pH, MEQ and conductivity, temperature and solvents. Keep parameters within limits specified on product date sheet.

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2) Controlling Solids Content or N.V.C.

Adding concentrate to replenish material used during the coating process. Coating of parts or components will use up the working solution solids. This must be replenished by adding concentrate. The solids content should be kept within the specified product range.

Addition of Concentrate (feed) required is calculated with following formulae:

(B x (C - D)) / E = A (requested concentrate lacquer)

Where :

A = Litres Berkem Concentrate required
B = Volume of bath in litres
C = Required solid content %
D = Present solids content %
E = Solids content % of concentrate

Example :

100 liters of coating has the 6.5% od dry residue. The optimal residue is 10 %

Math : (100 x (10-6,5)) / 40 = 8,75 Liters of concentrated required

Concentrate Replenishing Procedure

- Measure out required volume of concentrate, (pigmented concentrate must be thoroughly stirred before proceeding to Step B).
- Slowly add two parts bath working solution to one part concentrate whilst continuously mixing with a flat bladed paddle
- Continue mixing for at least five minutes until a homogenous and uniform mixture is obtained.
- Add a further 1 part bath working solution and mix well.
- Pour solution slowly into weir section of coating tank.
- Repeat procedure until all required concentrate is diluted
- Allow working solution to circulate through filter system for 15 minutes before using the bath, or preferably make additions at the end of each working day.

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Addings of solvent and additives

The solvents CATAFOR 400S1 , CATAFOR 400S2 , CATAFOR 400S3 can be added directly in the coating tank or in the weir tank.. After the addings, wait 15 minutes before to work. The CATAFOR 400PH can be added directly in the permeate tank or in the coating tank. In case of room temperature over 30°C, daily addings of 0.15-0.25 ml/l of CATAFOR 400S1 will be neccesary.

In order to calculate the ammount of CATAFOR 400PH necessary to increase the MEQ , follow this formulae :

(B x C) / 10,67 = A (ml di CATAFOR 400PH) Where :

A = ml dofCATAFOR 400PH
B = Tank volume (liters)
C = increase required of MEQ
10,67 = factor

Example :

Increase of 5 MEQ in 100 liters coating tank = (100 x 5) / 10,67 = 46,7 ml of CATAFOR 400PH

How to Add Dye Solutions

These dyes MUST be mixed with the Concentrate before adding to bath solution NEVER add dyes directly to a working bath solution

Making up a New Bath with Dyes

1. Measure required amount of the Concentrate into a clean plastic or stainless steel container
2. Accurately measure out required amount of dye or dyes
3. If using a mixture of red and yellow dyes it is best to add red dye first and yellow second.
4. Add dye to the concentrate and mix well into concentrate with a flat bladed slow speed paddle or mixer.
5. Follow new bath “Let Down” procedure at pg.8-9 MAKING UP A NEW COATING TANK section of manual.

Additions of Dye Solutions to an Existing Working Bath Procedure

1. Measure required amount of the concentrate into a clean plastic or stainless steel container
2. Accurately measure out required amount of dye or dyes
3. If using a mixture of red and yellow dyes it is best to add red dye first and yellow second
4. Add dye to the concentrate and mix well into concentrate with a flat bladed paddle or mixer.
5. Progressively add 2 parts dilute bath material to 1 part concentrate whilst stirring continuously and mix well for at least five minutes with a flat bladed paddle until a smooth homogenous uniform mixture is obtained.
6. Add a further 1 part dilute bath material and mix well.
7. Pour solution slowly into tank weir and allow mixed material to circulate through the system for at least 15 minutes before using the bath.
8. It is best to make frequents regular replenishing additions at the end of each working day.

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Notes:
These dyes are transparent, the final colour is dependent on the base metal substrates and coating thickness It should be noted that the depth of colour for transparent colours varies with the thickness of the deposited film. To control the thickness, the bath parameters, voltage, time and temperature must be controlled and stable

Mixing Apparatus and Tanks
Manual mixing with some form of flat bladed mixing implement is OK for small additions and will give adequate mixing. Large quantities of concentrate additions will need a powered or motorised slow speed stirrer

A "broom stick" IS NOT a suitable mixing implement
All mixing apparatus and measuring vessels used should be for Berkem Process chemicals only. This is to prevent co tamination from other process chemicals. Any material in contact with Berkem product range should be inert. Do not use mild steel, aluminium copper, zinc, tin or alloys. Plastics such as polypropylene, PVC and nylon are suitable. Grade 316 stainless steel is required for metal components.

TEST METHODS

Test methods for the working solution parameters.

1. Solids Content or Non Volatile Content (N.V.C.)
2. Conductivity Measurement
3. pH Measurement
4. MEQ Measurement
5. Solvent Levels

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1 - Laboratory Test Method Solids Content

Equipment Required:

- Accurate Weighing Scales (4 decimal place.)
- 3 x Aluminium or Tin Foil Dishes
- Pipette or spatula
- Oven at 120 degrees C

Method:

1. Weigh each dish accurately and record the weight (Wt.A).
2. Using a pipette or spatula accurately weigh approximately 1 gram of test sample into dish. Record as (Wt.B)
3. Place the dishes in an oven at 120°C for one hour. It is recommended to place the dish in the centre of the oven due to possible temperature variations in the corners of the oven.
4. When cool. Re-weigh promptly after one hour in the oven (the foil tray cools very quickly). Record as (Wt.C)
5. Calculation: (Wt.C - Wt.A) / (Wt.B - Wt A) = Solids Content %
6. For accuracy the test should be repeated 3 times using separately identified dishes
7. Take an average of the 3 dishes tested. If there is a large variation in results, (greater than 0.5%) the test should be repeated for an accurate result.

Notes

Ensure dishes used are free from any grease or dirt. Clean with acetone if necessary

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2 - Laboratory Test Method conductivity

Laboratory Equipment Required

- Conductivity Meter
- Range 0 – 1999 micro siemens.
- Resolution 1 micro siemen
- 250ml Beaker

Chemicals Required

- Working bath solution
- Calibration Standard Solution (Potassium Chloride (KCl) 1413 micro siemens @ 25 C)

Conductivity Measurement

Conductivity is measured using a standard conductivity meter

Procedure

1. Pour working solution test sample into clean beaker meter
2. Calibrate conductivity with KCl standard solution
3. Clean probe in deionised water
4. Immerse conductivity probe in to working bath solution
5. Take reading
6. Record reading
7. Clean probe

Notes

Over time the probe can be come dirty with working solution residues. This can give false pH readings. It is best to clean conductivity probe by soaking the probe in CATAFOR 400S1 Solvent Replenisher. After cleaning calibrate conductivity meter with Potassium Chloride (KCl) standard solution (typical value 1413 µS microSiemens/cm @25 Degrees Celsius)

Temperature

With most modern conductivity meters no adjustment of sample temperature is needed. As a rule modern conductivity meters have a built in ATC (automatic temperature compensator) and should be calibrated to value stated on KCl standard bottle (1413 µS). When taking reading with older conductivity meters (lacking ATC capability) the test sample needs to be adjusted to 25 Degrees Celsius. If it is not easy to adjust the sample temperature the value from the standard solution temperature conversion chart can be used

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3 - pH Test Method

Laboratory Equipment Required

- pH Meter
- Range 0 – 14
- Resolution 0.1
- 250ml Beaker

Chemicals Required

- Working bath solution
- pH Buffer solutions pH 4.0, pH 7.0 and pH 10.0

pH Measurement

pH is measured using a standard pH meter

Procedure

1. Pour working solution test sample into clean beaker
2. Calibrate pH Meter with buffer solutions
3. Immerse pH probe in to working bath solution
4. Take reading
5. Record reading
6. Clean probe

Notes

Over time the probe can be come dirty with working solution residues. This can give false pH readings. It is best to clean pH probe by soaking the probe in CATAFOR 400S1 Solvent Replenisher pH readings give a basic indication of the acid level of the bath solution but it is not an accurate way of monitoring or controlling acid content of working bath solutions Do not use pH readings to control the acid level of the coating bath solution. MEQ test is the only accurate method.

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PROCESS TECHNICAL DATA SHEET

CATAFOR 400 *series*

CATAPHORETIC LACQUERS

Colours : **Various** Use : **Bath** Colors coordinates **: ND**

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4 - MEQ (Corrected) Test Method

Laboratory Equipment Required

- pH Meter
- Range 0 – 14
- Resolution 0.1
- 250ml Beaker
- Burette 50 ml
- Magnetic or manual stirrer
- 250ml Beaker
- Weigh Balance to 1 decimal place or 100 ml measuring cylinder

Chemicals Required

- Working bath solution
- CATAFOR 400R Rinse Aid
- 0.1Molar Potassium Hydroxide (KOH) Solution in Ethanol
- pH Buffer solutions pH 4.0, pH 7.0 and pH 10.0

PROCEDURE

1. Measure Solids Content of bath solution (see solids content test method TM1).
2. Calibrate the pH meter using buffer solutions.
3. Weigh 50 grams of well-stirred bath solution sample into a 250ml beaker.
4. Add approximately 10 grams of Rinse Aid (up to 15 grams if the solid is above 12%).
5. Make up total weight in beaker to 200 grams with Deionised water. You now have your test sample.
6. Immerse pH probe into test sample and agitate constantly during titration procedure.
7. Fill 50 ml burette with 0.1Molar KOH.
8. Slowly titrate test sample with 0.1Molar KOH until the pH reaches end point of pH 9.0.
9. Note the number of mls of 0.1Molar KOH required = Titre A.

Math = MEQ for 100 g = Tit.A x 2 - - MEQ corrected = (MEQ for 100 g x 10) / solids content

Example

Solds content in the coating solution = 10.5 % where Tit.A = 21.5 ml

MEQ for 100 g (NOT corrected with the solids content) = 21.5 x 2 = **43**

MEQ **corrected**= (43 x 10) / 10.5 = **40.95.** (the MEQ must to be corrected to a 10% of solids content)

Important Notes on MEQ (or Total Acid Content)

MEQ is the only accurate way of measuring the true acid level of the coating bath solution. MEQ is quoted as a "corrected" figure to give theoretical value at 10% Solids Content MEQ is an abbreviation of the term milliequivalents expressing total acid concentration of a cathodic type working solution. It is an accurate and important method for me suring the true acid content of an electrophoretic bath working solution. If the MEQ is allowed to fall lower than the specified limits the bath solution can become unstable. This can cause Ultrafiltrate unit membranes to block and bits or defects on the coated components. The MEQ of a working bath will fall when permeate is dumped or when the bath is contaminated with alkali. It is important when dumping permeate to replenish acid loss with the correct amounts of CATAFOR 400PH Stabilizer.

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5 - Measuring Solvents

It is not normal for most users to do solvent analysis. When required Berkem Corporation or your local analytical test laboratory can do solvent analysis. If you have a gas chromatograph please discuss a recommended method with Berkem. Solvent analysis is done by Gas Chromatography. The exact method will vary depending on the type and model of equipment used. A sophisticated computer controlled instrument once set up and programmed will do a complete analysis recording the results directly as a percentage solvent in the bath.

TROUBLESHOOTING GUIDES

1. **High Working Bath Conductivity**
2. **Cratering In Electrophoretic Coatings**
3. **General Trouble Shooting Guide**

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1) High Working Bath Conductivity

- Rising conductivity in a working bath can be due to a number of causes but is normally due to:
- Carry over of plating chemicals, ionic or other contamination into working solution bath
- Poor quality pre rinsing
- Component parts that have fallen into working bath
- Increase in solids content after concentrate additions
- False readings due to conductivity meter being out of calibration (dirty probe)

It is important to minimize the amount of contamination entering the working bath when ever possible. This will maintain the working bath stability and a high quality appearance

Action Procedure

- Clean conductivity probe and calibrate conductivity meter with Potassium Chloride (KCl) standard solution (typical value 1413 µS micro siemens @25 Degrees Celsius) With most modern conductivity meters no adjustment of sample temp rature is needed. As a rule modern conductivity meters have a built in ATC (automatic temperature compensator) and should be calibrated to value stated on KCl standard bottle (1413 µS). When taking reading with older conductivity m ters (lacking ATC capability) the test sample needs to be adjusted to 25 Degrees Celsius. If it is not easy to adjust teh sample temperature the value from the standard solution temperature conversion chart can be used.

If meter is calibrated correctly and conductivity is still high then following action is required

- Replace CLP (Closed Loop Filtration) with new resin cartridge filter
- Dump (throw away) Ultra filtrate permeate equivalent to 50% of bath volume (This is normally taken from the U/F permeate rinse tank.) Example: if you have a 200 Litre working bath. 100 litres of permeate will need to be dumped To keep the coating tank MEQ and solvent in balance it is essential to replace the volume of dumped permeate with an equivalent volume of artificial ultra filtrate solution

NOTES

After the dumping and replenishing procedure it is best to recheck MEQ value after 24 hours Dumping ultra filtrate will lower the MEQ (acid value) and water miscible solvent levels in coating solution bath **Caution** If the bath MEQ drops below minimum value the bath can become unstable and cause U/F tubes to block. If the bath is very contaminated U/F dumping procedure may have to be repeated several times before an improvement in appearance

For example dumping 200 litres of permeate from a 200 Litre bath will only remove 50% of contamination from bath. Dumping 400 litres of permeate will remove 75% of contamination from bath

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2) Cratering In Electrophoretic Coatings

Cratering Defect *(some times described as Fish Eyes or Cissing)*

Craters normally are bowl-shaped depressions with material in the centre and raised circular edges.
They are usually caused by contamination of the bath, rinses or substrates with particulates, chemicals or incompatible oils. Often it is difficult to identify the cause of cratering without close investigation of the process line. A permanent s lution to cratering must be to identify and eliminate the source of contamination.

Contamination typically comes from:

- Insufficient cleaning of base metal substrates
- Rust or other particles in oven
- “Salting out” of resin by iron or alkali contamination
- Silicone containing products e.g., Sealants, lubricants, domestic polish, wide range of aerosol sprays and some hand barrier creams
- Dried foam or tide level around tank causing dried resin gel particles to form
- Carry over from pre-treatment process or chemicals
- Polishing compound residues
- Residual surfactants from plating process
- Greases or lubricants left on substrate surface
- Nearby manufacturing processes causing airborne contaminants to enter the electrophoretic system tanks or oven
- Post tank contamination of coated parts with rinse particulates
- Chain oils or conveyor drips in coating tank, rinse tanks or oven

A crater like defect can also be from:

- Blow out of contamination in the oven from porous substrates (e.g. castings)
- Air bubbles or electrolytic gas in coated film
- Gas pitting in electrodeposited plated layers
- Addition of non-water miscible solvents when added directly to coating tank (Without correct premix procedure)

Cratering Problem Solutions
A permanent solution to cratering must be to identify and eliminate the source of contamination. Keep all aerosols out of coating area. Silicone containing aerosols will cause severe cratering Filtrating the complete bath through a fine filter will often solve the problem. In clear and dyed coloured baths a 1 micron absolute cartridge filter can be used Pigmented systems should **NOT** be put through a 1-micron filter. Depending on the type of cratering special anti-cratering additives from Berkem Corporation Ltd can help mask the problem. The defect can then be “worked out” of the bath by co ting components. In severe cases a new bath may-be required or partial dilution of the contaminated bath with fresh feed concentrate m terial.

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No.	PROBLEM	POSSIBLE CAUSES	RECOMMENDED ACTION
1	Thick deposit	• Voltage too high • Temperature too high • Coating time too long	• Reduce voltage • Operate at 23-28°C • Reduce coating time
2	Orange peel	• Solvent too high • High surge current	• Purge with ultrafiltration • Reduce voltage
3	Thick/Rough / Uneven film	• Initial surge current too high • Temperature too high • Ionic contanimation	• Lower surge current • Reduce anode area • Reduce temperature • Purge with UF unit
4	Thin deposit	• Voltage too low • Coating time too short • Solid/Solvent too low	• Increase voltage • Increase coating time • Analyze and adjust solid/solvent level
5	Thin film with high density pitting	• Solid/Solvent too low • Temperature too low	• Analyze and adjust solid/solvent level • Operate at 23-28°C
6	Iridescent deposit	• Deposit too thin • Temperature too low	• Increase voltage and or coating time • Operate at 23-28°C
7	Thin patchy deposit	• Solvent too low • Solids too low • pH too low	• Analyze and adjust solvent level • Analyze and adjust solid level • Check pH
8	Rough, spotty scattered pits	• Metallic contamination • Dirty,dusty oven • Insoluble particles • Poor quality rinse water	• Strip lacquer coating and check substra-te condition • Clean oven thoroughly • Batch filter follone up with ultrafiltration • Use deionised water with a conductivity less than 5 micro Siemens
9	Water breaks during post rinses	• Solvent too high	• Purge with UF unit
10	Water marks after curing	• Incorrect or insufficient post rinsing • Incorrect drying procedure	• Prepare fresh rinse of CATAFOR 400R solution • Refer to drying procedure

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No.	PROBLEM	POSSIBLE CAUSES	RECOMMENDED ACTION
11	Gas pits / voids	• Too much aeration in the solution • Incomplete wetting of parts surface prior to coating	• Correct pump problem and use gentle agitation;minimize aeration and roaming actions • Refer to pre-rinsing procedure
12	Soft deposit;poor chemical resistance	• Low curing temperature • Insufficient curing time	• Cure at metal temperature reccommen-ded on TDS • Increase curing time
13	Darker(discolouration	• Curing temperature too high	• Decrease curing temperature
14	Low gloss/hazy deposit	• Deposit too thick • Solvent too low • Contamination	• Reduce voltage • Analyze and adjust solvent level • Purge with UF unit
15	Inconsistent quality	• Irregular or large additions of solids and/ or solvents • Insufficient mixing time after solids or solvent additions	• Make smaller,regular addition • Aloow one or two hoursof solution after each additions
16	Poor throwing power	• Incorrect anode/cathode ratio	• Use 1:5 minimum or 1:1 maximum ano-de/cathode ratio
17	Solution pH falling	• Contamination from acidic clearing or process chemicals	• Purge with UF unit
18	Solution pH rising / precipitation of resin	• Drag-in of alkaline contamination	• Prevent drag-in • Filter coating tank • Purge with UF unit • Add CATAFOR 400PH
19	Low conductivity	• Low solids • Low solvent	• Analyze and adjust solid and solvent
20	High conductivity	• High solids • High solvants • Ionic contamination	• Reschedule replenishment • Reduce voltage • Purge with ultrafiltration

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SUPPLIED PRODUCTS

CATAFOR 400L
Low thickness lacquer , expecially designed for Goldsmith (chains) or silversmith where an invisible film is required

CATAFOR 400H
High thickness lacquer, expecially disigned for costume jewelry, fashion artiche or fittings where very high chemical and wear resistance is required

CATAFOR 400PH
A blend of organic acids used to stabilise the working bath solution. It is also used to replenish the working bath after permeate has been discarded.

CATAFOR 400S1
This is the continuous phase solvent (C.P.) It is completely miscible with water and can be added directly to the bath via the weir. It helps formation of the deposited coating. Addings of 25-50ml/l every new tank of permeate.

CATAFOR 400S2
This blend of solvents and can be added directly to the bath or permeate tanks. This blend is responsible of deposit's gloss and it is used when the coating tank is not working regularly. Addings of 0.25-0.5% when required.

CATAFOR 400S3
This blend of solvents and can be added directly to the bath or permeate tanks. This blend is usefull to uniform the deposition. The addings are very small, usually 10ml/l when make up a new permeate tank.

CATAFOR 400R
Rinse Aid is a special surface-active agent, which is added to the final rinse. Rinse aid helps the water run off the parts evenly and prevent rinse marks or staining.

STR-27SP
It is a highly effective water based paint stripper, which is both nontoxic and biodegradable. It offers low VOC emissions and is not regulated by authorities for transport, storage or health and safety. It is safe for use on most metal components, including steel and aluminium.

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Notes

Instructions indicated in Our Process technical data sheets are the result of attentive checks and have been written as a guideline. They represent the best of our knowledge and refer to a normal use of our products. Such products are guaranteed in their quality up to the delivery: we cannot guarantee for the correct use of them, as this action in not under our direct control (addiction or correction to plating baths are made by customer's personnel). As a consequence, process instructions have not to be intended as a guarantee of the final result in the use of our products.

Safety Information

Please refer to the safety data sheets for any information regarding safety and disposal (MSDS).

Related articles

ARTICOLO	Descrizione	Colore	Packaging
VE010101	CATAFOR 400L concentrated low thickness lacquer	Neutral	1 - 25 Kg
VE010201	CATAFOR 400H concentrated high thickness lacquer	Neutral	1 - 25 Kg
VE010301	CATAFOR 400S1 Solvent replenisher		1 - 5 liters
VE010501	CATAFOR 400S2 solvent replenisher		1 - 5 liters
VE010601	CATAFOR 400S3 solvent replenisher		1 - 5 liters
VE010701	CATAFOR 400PH additive pH stabilizer		1 - 5 liters
VE010801	CATAFOR 400R Rinse aid		1 - 5 liters
VE011001	CATAFOR 401L ready to use low thickness lacquer	Neutral	1 - 25 liters
VE015001	CATAFOR 400H ready to use high thickness lacquer	Neutral	1 - 25 liters

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