IRIDITE 15

Chromate Conversion for Magnesium and Magnesium Alloy

Product Code: 178664

DESCRIPTION

Iridite 15 is a simple room temperature, short dip, chemical process for producing a corrosion protective coating on magnesium and magnesium alloys. The coating can be applied by dip or brush and forms an excellent bond with paints and lacquers.

READ ENTIRE TECHNICAL DATA SHEET BEFORE USING THIS PRODUCT

PROCESS COMPONENTS

Quick-Glance Flow Chart

1. Alkali clean
2. Cold running rinse
3. Acid pickle
4. Cold running rinse
5. Iridite 15 Mag-Coat
6. Cold running rinse
7. Cold running rinse
8. Dry

Note: Because of possible contamination of the treated surface, thorough rinsing is recommended after Iridite treatment for best results.

OPERATING PARAMETERS

Procedure for magnesium alloys with low aluminum (wrought, cast, and extrusions such as AZ31):

1. Hot alkaline clean
2. Rinse thoroughly
3. Acid pickle (chromic-nitrate) optional

Parameter	Range
Immersion time	
on mill pickled stock	15-30 seconds
on un-pickled stock	3 minutes
4. RINSE THOUROUGHLY	
5. Iridite 15 (Mix A)	
Temperature	75-100°F (22-38°C)
Immersion time	
with pickle treatment	15-30 seconds
without pickle treatment	2 minutes
Solution pH	0.2-0.6

6. Rinse thoroughly
7. Dry

Procedure for magnesium alloys with high aluminum (sand and die cast such as AZ61, AZ81, AZ91):

1. Hot alkaline clean
2. Rinse thoroughly
3. Acid pickle (bright pickle)

Parameter	Range
Immersion time	
on mill pickled stock	15-30 seconds
on un-pickled stock	2 minutes
4. RINSE THOUROUGHLY	
5. Iridite 15 (Mix A)	
Temperature	75-100°F (22-38°C)
Immersion time	10-30 seconds
Solution pH	0.2-0.6

6. Rinse thoroughly
7. Dry

Procedure for magnesium alloys without aluminum (such as ZK60, HK31, HK30, HZ32, ZK51, ZH62:

1. Hot alkaline clean
2. Rinse thoroughly
3. Acid pickle (chromic-nitrate) optional

Parameter	Range
Immersion time	
on mill pickled stock	15-30 seconds
on un-pickled stock	3 minutes
4. RINSE THOUROUGHLY	
5. Iridite 15 (Mix C)	
Temperature	75-100°F (22-38°C)
Solution pH	0.6-1.0
Immersion time	
with pickle treatment	15-30 seconds
without pickle treatment	2 minutes

6. Rinse thoroughly
7. Dry

MAKE UP PROCEDURE

Iridite 15 is received as a powdered compound. It is mixed with water, a specified amount of 20° Bé Hydrochloric Acid and ARP® 2. Mix A and Mix C are recommended, depending on the magnesium alloys to be treated.

	Mix A
Iridite 15:	5 oz/gal (37.5 g/l)
Hydrochloric Acid (20° Bé):	7.5 oz/gal (58.6 ml/l)
ARP 2:	1 ml/gal

	Mix C
Iridite 15:	5 oz/gal (37.5 g/l)
Hydrochloric Acid (20° Bé):	2 oz/gal (15.6 ml/l)
ARP 2:	1 ml/gal

Hydrochloric Acid Concentration

If the available hydrochloric (muriatic) acid is not 20° Bé, use the following table to determ ine proper concentration.

Density Deg. Bé	Specific Gravity	% HCl	Mix A fl oz/gal (ml/l)	Mix C fl oz/gal (ml/l)
16	1.124	24.6	9.6 (75)	2.6 (20)
18	1.142	27.9	8.5 (66)	2.3 (18)
20	1.160	31.5	7.5 (59)	2.0 (15.6)
22	1.179	35.2	6.75 (53)	1.8 (14)

EQUIPMENT

Use mild steel tanks lined with polyethylene or similar acid-resistant material. Use tantalum heating coils, or equal.

CHEMICAL MAINTENANCE & REPLENISHMENT

Maintain working solutions, Mix A and Mix C, by adding Iridite 15 compound and hydrochloric acid in the original proportions to keep within the required pH range or to maintain the color standard desired.

Maintain ARP 2 in the working solution by adding 1 ml of ARP 2 for every 5 ounces (142 gms) of Iridite 15 when solution is in constant use. If solution has not been used for a week or more, and a thin foam layer does not form during processing, add 1 ml of ARP 2 for each gallon (3.785 liters) of solution. It is very important that ARP 2 provides a thin blanket of foam during processing.

TROUBLESHOOTING GUIDE

Immersion Time vs. Coating Thickness:

When a magnesium surface is thoroughly prepared by mechanical cleaning or by alkali and acid cleaning, the Iridite 15 solution acts uniformly and forms its coating in 15 to 30 seconds. Extending the immersion in Iridite 15 beyond this point does not increase the film thickness; however, when the hydrofluoric acid pickle is used, it may be necessary to extend the immersion time in the Iridite 15 solution to 45 to 90 seconds to get complete coverage.

Magnesium die and sand castings which have been previously pickled should not exceed 1/2 to 1 minute immersion in Iridite 15 solution or an aluminum smut will develop.

Scratched Iridite 15 coatings can be touched up by swabbing with Iridite 15 working solution, followed by thorough rinsing with flowing water.

OTHER RECOMMENDATIONS

Stripping of Iridite 15 Coatings:

The Iridite 15 coating can be stripped by running through the standard cleaning procedure, using the pickle where dimensions are not critical. Where change in dimension cannot be tolerated, treat as follows:

1. Immerse in caustic soda, 16 oz/gal (120 g/l) at 180°F (82°C), until surface turns grey.
2. Rinse
3. Immerse in chromic acid, 24 oz/gal (180 g/l) at 180°F (82°C), until surface is clean
4. Rinse. This procedure may be repeated if necessary

Pre-pickling:

Acid cleaning on magnesium removes oxides, but it also performs a far more important function. Acids are used to remove surface impurities such as sand and iron in castings and embedded mill scale in sheet stock. These inclusions form nuclei for galvanic corrosion cells and, if not removed, lower the overall corrosion resistance. Maximum uniformity results only when sheet stock is pre-pickled in a solution of acetic acid and sodium nitrate long enough to remove .0005 in. (0.5 mils) of metal per surface. Castings should be pickled, after sand blasting, in a dilute sulfuric acid solution to remove .002 in. (2 mils) of metal per surface.

These pre-pickling operations are done most economically at the mill or foundry, and before any forming or machining is performed. Note that the chrome pickle process (Specification MIL-M-3171a Type 1, which is used as a temporary protective treatment) is not an adequate substitute for the pre-pickling operation described above. The chrome pickle does not remove enough metal for complete removal of surface inclusions. The appropriate pre-pickling should be specified in ordering the metal from the mill or foundry.

Pre-cleaning:

Heavy oils and greases are frequently removed by vapor degreasing. It is important to remember that a magnesium part, being lighter in weight than steel or aluminum, condenses far less solvent in a vapor degreaser. Because of this, it is frequently necessary to allow the work to cool then repeat the degreasing operation to do a thorough job. Pigmented drawing compound and buffing compounds are best removed with an emulsion cleaner used in a soak tank or power washer.

When graphite is used as a lubricant in hot drawing, these pre-cleaning methods do not remove it. This is done by a 20 minute soak in a strong caustic soda solution followed by immersion in the chromic acid-sodium nitrate pickle. This operation should follow drawing as

soon as possible. If the graphite is allowed to remain on the magnesium for over 24 hours it is very difficult to remove.

Alkali cleaning:

Strong solutions of sodium hydroxide at 8 to 16 oz/gal. (60 to 120 g/l), 180°F. (82°C), and 3 to 5 minutes immersion or proprietary materials of the types normally used on steel are recommended and result in no measurable metal loss. Mild inhibited alkalies such as those used for non-etch cleaning of aluminum are not generally applicable to magnesium since they may cause etching. The pH of the cleaning solution used must be 12 or higher.

The alkali cleaning solution also removes old chrome pickle films which can interfere with the process.

Pickling:

Work in process is pickled to remove oxides and residues from alkali cleaning. The following solutions have been found effective in preparing work for Iridite treatment. Only short immersions are necessary on work that has been pre-pickled adequately or on machined surfaces. The choice of pickle depends on the alloy being processed.

1. Chromic-nitrate pickle (for magnesium alloys with 3.5% aluminum or less):

Chromic acid	24 oz/gal (180 g/l)
Sodium nitrate	2 oz/gal (30 g/l)
Solution temperature	65-90°F (18 to 32°C)
Solution pH	0.5-0.7

Maintain within pH range by additions of chromic acid.

2. Bright pickle (for magnesium alloys with aluminum over 3.5%):

Chromic acid	37.5 oz/gal (28 g/l)
Conc. nitric acid	3.5 fl oz/gal (26 g/l)
Hydrofluoric acid	1 fl oz/gal (7.8 ml/l)
Solution temperature	65-90°F (18-32°C)
Solution pH	0.3-0.6

Maintain by adjustment to original pH by additions of chromic acid.

3. Fluoride pickles (for all alloys):

When dimensions are extremely critical, a hydrofluoric acid pickle or an ARP 28 pickle may be substituted for the pickles above. Remember, however, that a fluoride pickle is a compromise. The only impurities it can remove are those at the metal surface. Furthermore, if the time is not limited, it may passivate the metal to the point where an Iridite chromate film will not form. For maximum protection when this type of pickle is used, the following conditions must be met.

1. Sheet stock must be given the acetic acid-sodium nitrate mill pickle either before forming, or during the cleaning cycle. Castings must be pre-pickled at the mill or before machining to remove at least 0.002 in. per surface.
2. The immersion time in a fluoride pickle must be limited to the period of initial vigorous gassing. When the gassing stops, or is markedly reduced, the work must be removed from the pickle and rinsed thoroughly.

The following formulation can be used for this type of solution: Hydrofluoric acid (60%) - 20% by volume

Metex Etch Salts, a safer more convenient product, can be substituted for hydrochloric acid pickle in the following concentration:

Metex Etch Salts - 5.2% by volume

Either solution is used at room temperature for only as long as it takes the initial vigorous gassing to subside.

Another use for the fluoride pickle occurs when die castings (AZ91) and thin (1/8 in. thick or less) sand castings (AZ63 or AZ92) are being treated. These metals have an irregular surface layer of Al, Mg or Al Mg present which will not take a dark Iridite coating.

3 3 4

Even when the final color is uneven, the lighter surface is passivated by the Iridite coating well enough to resist corrosion as well as the adjacent darker surface. However, if an even brown finish is necessary, extending the time in the hydrofluoric acid pickle to 1 or 2 minutes usually removes the surface layer of aluminum-magnesium compound. In the subsequent treatment with Iridite 15 it may be necessary to extend the immersion time.

Rinsing:

As with all surface treatments of magnesium, rinsing is an important step of the process. The time of all cold rinses should be 15 to 20 seconds. This includes the rinses following Iridite treatment as well as those following cleaning and pickling. Two rinses are recommended following the Iridite operation to insure a contamination free surface.

On castings, the final rinse may be hot (140 to 160°F, (60 to 71°C) using an in-and-out dip to facilitate drying. This temperature on sheet stock results in softening of the coating which may be detrimental in some applications.

Drying:

Drying may be accomplished by air blast, centrifuge, or hot circulating air. Drying temperatures in excess of 160°F (71oC) produce a dark brown coating of increased hardness and reduced corrosion resistance. Temperatures up to 200°F (93oC) are satisfactory.

SAFETY & WARNING

MacDermid Enthone recommends that the company/operator read and review the Safety Data Sheets for the appropriate health and safety warnings before use.

Safety Data Sheets are available from MacDermid Enthone.

WASTE TREATMENT

Prior to using any recommendations or suggestions by MacDermid Enthone for waste treatment, the user is required to know the appropriate local/state/federal regulations for on-site or off-site treatment which may require permits. If there is any conflict regarding our recommendations, local/state/federal regulations take precedent.

ORDER INFORMATION

Product	Code
IRIDITE 15	178664

CONTACT INFORMATION

To confirm this is the most recent issue, please contact MacDermid Enthone

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Also read carefully warning and safety information on the Safety Data Sheet. This data sheet contains technical information required for safe and economical operation of this product. READ IT THOROUGHLY PRIOR TO PRODUCT USE . Emergency safety directory assistance: US 1 202 464 2554, Europe + 44 1235 239 670, Asia + 65 3158 1074, Brazil 0800 707 7022 and 0800 172 020, Mexico 01800 002 1400 and (55) 5559 1588

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