Do's & Don'ts

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Do's and Don'ts of Defects in Substrates

The condition of the surface to be coated has a major influence on the quality of the plated deposits. Some are obvious, such as:

- Visible scratches
- Pits
- Roughness
- Discoloration from heating or colors used for fabrication
- Dissimilar metals
- Overlapped joints
- Overtapped join
- Sharp edges
- Metal splinters
- Dents and highly irregular shapes
- Pockets that can entrap difficult-toclean foreign materials such as spot welds
- Arc welds that are porous or cracked
- Magnetic metals that hold particulate matter

Some defects that are only visible with a microscope can also cause plating defects, such as microscopic particles slivers, tiny pits, surface inclusions and tiny pores. Metal splinters are particularly onerous because many of them can protrude upward, and be completely plated over, but with their point covered by only a small amount of plated deposit. These are sources of failure in corrosive environments.

Additional problems are caused by dissimilar metals in contact, gas entrapment in castings, burns, slag and residual magnesium. Powdered metal fabricated items always contain numerous pores. Porous items may have contaminants in the pores that bleed out during the plating process. Pores can entrap cleaners, and acid treatments that are difficult to rinse out. Repeated hot and cold rinsing should be used to try to remove residual contaminants from the holes. The temperature of the hot cycle should be significantly above the highest temperature of the plating or processing solutions.

In cleaning, sometimes grease and oils are removed, leaving particles tightly held to the surfaces. This is often true when a solvent is used. Most solvents remove oil and grease very well but leave particles and splinters on the surface, making it difficult to impossible for the alkaline cleaners to remove them. In many cases it is best not to use solvents. The alkaline cleaners will remove both oils and particles. Electrocleaners help remove particles. Anodic current is best for most applications, but direct (cathodic) cleaning produces twice the amount of gas bubbles and may be needed for particle removal. The use of both cathodic (direct) followed by anodic cleaning works well. There are mild acid cleaners that work will where applicable.

Items to be plated that have deep recesses or irregular surfaces, including protrusions that will be close to anodes in the tank, require shields or robbers to even the current distribution, and to prevent thick and thin areas and/or burning.

Aluminum has the potential to have defects due to the plating process. Over-etching can occur due to alkaline cleaners with high pH, alkaline etching, too long in the deoxidizer or too long in the long zincates. Each step can cause pit defects and if long times are used in each, it is likely to cause pitting defects in the plated deposit.

Do's

1. Inspect items to plate to determine what, if any, defects are present and determine how to deal with them.

- Know that contaminants entrapped in crevasses, or holes in the surface could bleed out in the plating process and have a negative effect on the plating solution.
- 3. Use alternate hot and cold rinsing following each process step to remove materials entrapped in the pores.
- 4. Keep anode area as constant as possible.
- 5. For nickel solutions, use polypropylene bagged titanium baskets where possible. Keep anode bags full. Bar anode slivers should be removed or grouped together. Most plating solutions use bagged anodes. Keep bags clean.
- 6. Keep the anode length a little above the lowest part of the items being plated for more even current distribution.
- 7. Use robbers or shields when plating irregular shapes.
- 8. Be aware that there are some reactive grinding lubricants that can only be removed by abrasion. Solvents and alkaline cleaners will not remove them.

Don'ts

- 1. Allow particles to spill over the top of the anode bags.
- 2. Plate items that show defects until you deal with the consequences of plating surfaces and how they may affect the plating solution and the finish of the surfaces.
- 3. Plate items with defects without understanding the consequences and having communicated with the user of the items.
- 4. Solvent clean prior to alkaline cleaning if at all possible. *P&SF*