

Description

Image

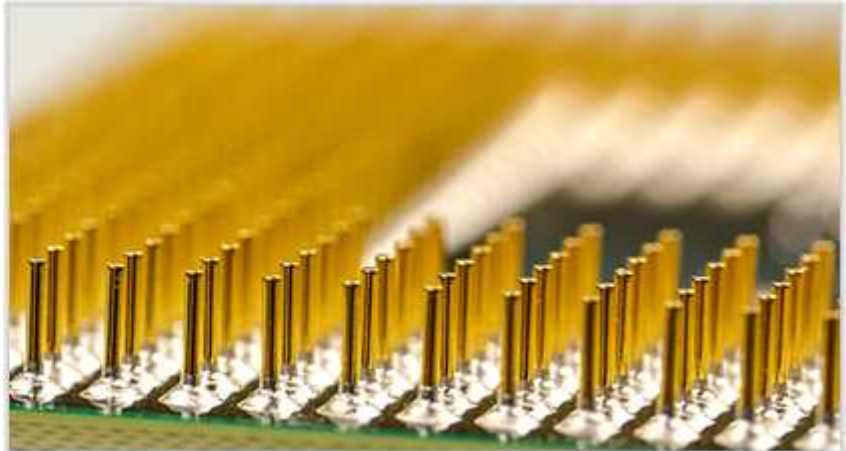


Image caption

(1) A portable electropolishing system which removes corrosion from metal products. The hand-held unit can be operated on a work bench and permits the removal of small areas of corrosion without disturbing other areas of a metal work piece © Energy.gov at Wikimedia Commons [Public domain] (2) Electro pins between processor and cpu © Blickpixel at Pixabay [Public domain]

The process

ELECTRO-POLISHING is electro-plating in reverse. It offers an escape from the high cost of mechanical polishing, but at the penalty of much lower precision. The component is connected to the positive side of a low voltage direct current power source while a cathode is connected to the negative side, both immersed in a conductive solution. During the process, a layer of oxides or salts forms on the surface of the component; the layer controls the dissolution so that high points of a rough surface are dissolved faster than lower points. The final result is a metal surface with a smooth glossy appearance.

Process schematic

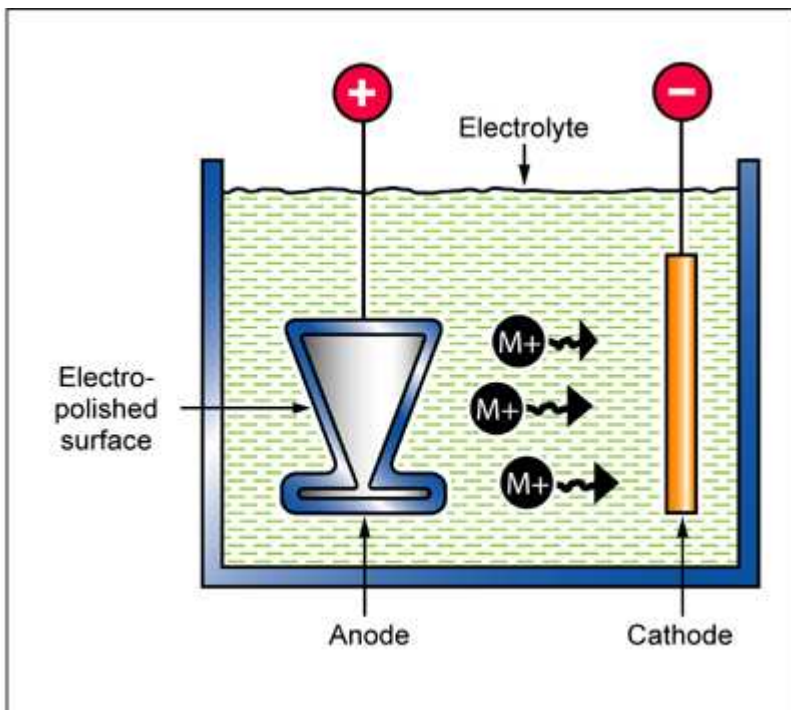


Figure caption

Electro-polishing

Material compatibility

Metals - ferrous	✓
Metals - non-ferrous	✓

Function of treatment

Decoration	✓
Reflectivity	✓
Surface texture	✓

Economic compatibility

Relative tooling cost	low
Relative equipment cost	medium
Labor intensity	low

Physical and quality attributes

Surface roughness (A=v. smooth)	A
Curved surface coverage	Good
Surface hardness	25 - 100 Vickers
Processing temperature	-0.15 - 86.9 °C

Process characteristics

Discrete	✓
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Supporting information
Design guidelines

Most metals can be electro-polished. Electro-polished surfaces are brilliant and have superior heat and light reflectance. The surface, however, has less mirror-like reflectivity than conventionally polished surfaces. More complex shapes can be polished than are possible by mechanical polishing, but less polishing occurs in holes, recesses and slots than on more prominent surfaces.

Technical notes

Electro-polishing is suitable for stainless steels, mild steels and low alloy steels, aluminum, brass, zinc die-casting alloys, beryllium copper, nickel silver, molybdenum, and tungsten. No special pre or post-treatments are needed. The most economical surface finish attainable by the process is 0.4 microns and the finest is 0.05 microns which can be achieved - but at a higher cost.

Typical uses

Electro-polishing is used for parts as small as 20 mm square in area such as miniature electrical contacts, rivets, and screws found in the electronics industry. It is used also for components as large as refrigerator doors with polished surface area of 1 m square or more. A wide variety of household, commercial, and military products are electro-polished.

The economics

The process does not normally require a tooling investment for any unique component, hence it is economical for all levels of production. It requires less labor and less expensive equipment than mechanical polishing, but the initial capital cost can be high. Process time for any one component ranges from 3 - 10 minutes plus the time required for cleaning, rinsing and other preliminary and subsequent steps.

The environment

Many electro-polishing baths pose environmental and health hazards. Some contain disagreeable chemicals - those with cyanogens are downright nasty. Protection from chemical pollutants and toxic vapor requires special precautions, as does the disposal of the polishing medium.

Links

MaterialUniverse

Reference
