Chemical polishing

Description

Process schematic

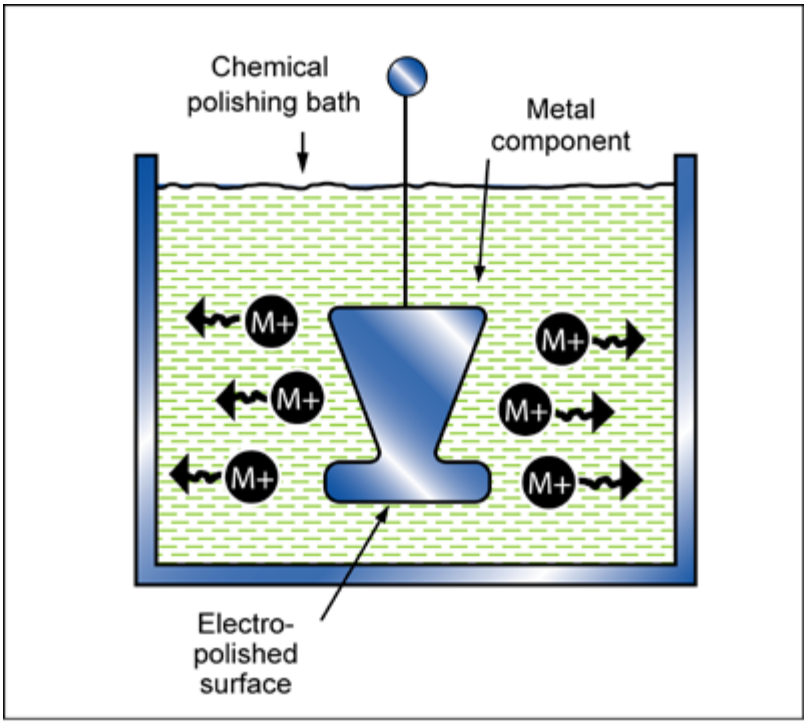

Figure caption

Chemical polishing

The process

If a bar of soap with a rough surface is immersed in water, it emerges smoother than it went it. That is because the soap dissolves faster at the peaks of the roughness than at the troughs because the local concentration gradient is steeper there. CHEMICAL POLISHING relies on a similar principle. It is a process whereby a surface is smoothed by controlled chemical dissolution in a bath of acid containing additives that, by creating a surface boundary-layer, cause protrusions to dissolve faster than flat or intruded components of the surface - there is no external power supply. The process is normally carried out at high temperatures to increase the polishing rate. Chemical polishing, like electro-polishing, is a way of brightening a surface, enhancing reflectivity, but without the dimensional precision of mechanical polishing. Much cheaper, of course.

Material compatibility

Metals - ferrous	✓
Metals - non-ferrous	✓

Function of treatment

Decoration	✓
Reflectivity	✓
Surface texture	✓

Economic compatibility

Relative tooling cost	low

Values marked * are estimates.
No warranty is given for the accuracy of this data

Relative equipment cost	low
Labor intensity	low

Physical and quality attributes

Surface roughness (A=v. smooth)	A
Curved surface coverage	Good
Coating thickness	* 2 - 25 µm
Processing temperature	54.9 - 140 °C

Process characteristics

Discrete	✓

Supporting information

Design guidelines

Chemical polishing offers a greater degree of freedom in polishing items with blind holes and other recessed areas. It can treat components of different shapes at the same time. The reflectivity of the surface is less than that given by electro-polishing; the chemically polished surface is often anodized subsequently to produce a clear, colorless protective oxide coating.

Technical notes

Aluminum, copper and stainless steel are commonly treated by chemical polishing. Chemical polishing baths are generally based on combinations of phosphoric acid, nitric acid, sulfuric acid, hydrochloric acid, organic acids and special surfactants and stabilizers; some are based on peroxides. The process is controlled by the chemistry of the bath, the temperature and the time of immersion.

Typical uses

Jewelry, razor parts, automotive trim, fountain pens, searchlight reflectors, architectural trim, household appliances, thermal reflectors for components of space vehicles.

The economics

Chemical polishing has tended to replace electro-polishing due to lower costs. The process is cheap to set up and operate: no power supply or expensive racking are needed, and the capital investment and labor costs are low.

The environment

The chemicals involved here are aggressive but manageable. Disposal of spent chemical polishing fluids requires a recycling loop.

Links

MaterialUniverse

Reference