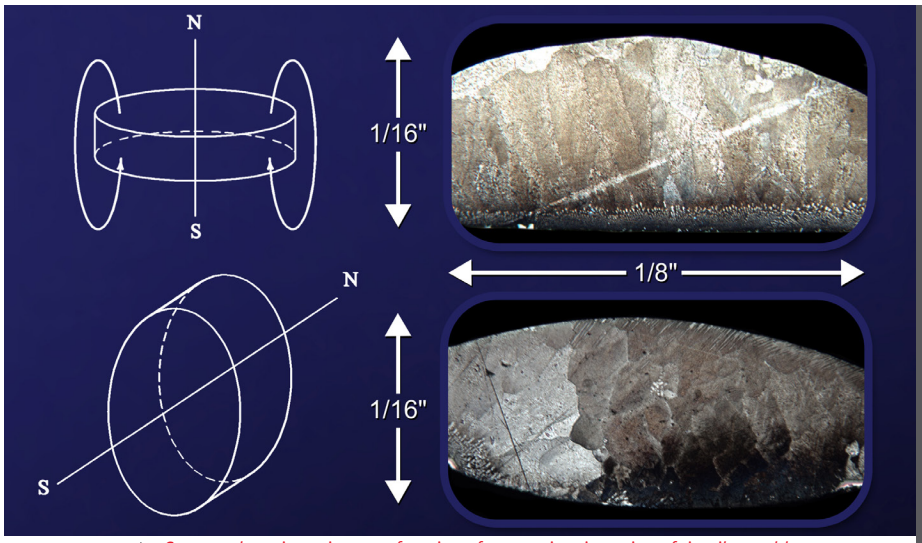
Magnofex



Structural reorientation as a function of magnetic orientation of tin-silver solder.

Magnofex is a processing method for nonferrous metal deposition which uses magnetic fields to manipulate the microstructure of the deposited metal. Strategic orientation of magnets controls grain structure in a manner that enhances the strength and mechanical properties of the metals involved. Lead-free solders, which are nonferrous metals, can greatly benefit from the presence of magnetic fields during soldering. Consisting primarily of tin, lead-free solders often exhibit a paramagnetic-to-diamagnetic shift as they solidify in the presence of a magnetic field. Strategic orientation of magnets during soldering processes controls the solder's grain orientation, improving the performance and reliability of the lead-free components and reducing the propensity to form "tin whiskers."

MATERIALS PROCESSING AND MACHINING

Features

- Simple — employs magnetic influence
- Inexpensive — requires minimal equipment
- Flexible — adapts easily to current manufacturing processes and is transportable
- Versatile — works with new products as well as rework and repair
- Broad — spans across all lead-free solders
- Unique — employs none of traditional solutions for mitigating tin whisker growth (e.g., conformal coating techniques, solder/alloy alteration)

Benefits

- Reduces mechanical failure — increases ability of electronics to withstand shock and vibration, increases wettability, decreases board delamination
- Improves manufacturability — reduces tin whisker formation/pad cratering, aids in solder reballing, enables retrofitting existing solder stations to current manufacturing techniques
- Addresses issues regarding lead-free solutions for manufacturing and plating applications

Applications

- Electronic components
- Aircraft propeller blades
- Compressor turbine blades
- Welding
- Brazing
- Food processor blades
- Cutting tools

Patents & Awards

- U.S. Patent 9,181,611
- Technology Ventures Corporation–featured technology, 2012

Inventors

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Technology Readiness Level (1–9)

Component and/or breadboard validation in a relevant environment.

Partnering Opportunities

Y-12 is seeking an industry partner to fully commercialize this technology.

If you would like more information, please contact the Office of Technology Commercialization and Partnerships:
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