

Achieving Effective Low Cost, Low Volume, Conformal Electromagnetic Shielding using Thermal Spray Coatings

SAND2005-7264P



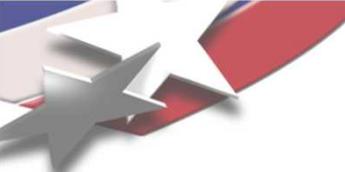
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EM Shielding using Thermal Spray Processes

- Thermal spray processes provide an inexpensive means to shield a wide variety of sensitive components from EM pulses
- Shielding can be applied to parts of all different sizes and shapes with minimal increases in volume and weight



Several Thermal Spray Technologies Available

Plasma

Wire flame

Cold spray

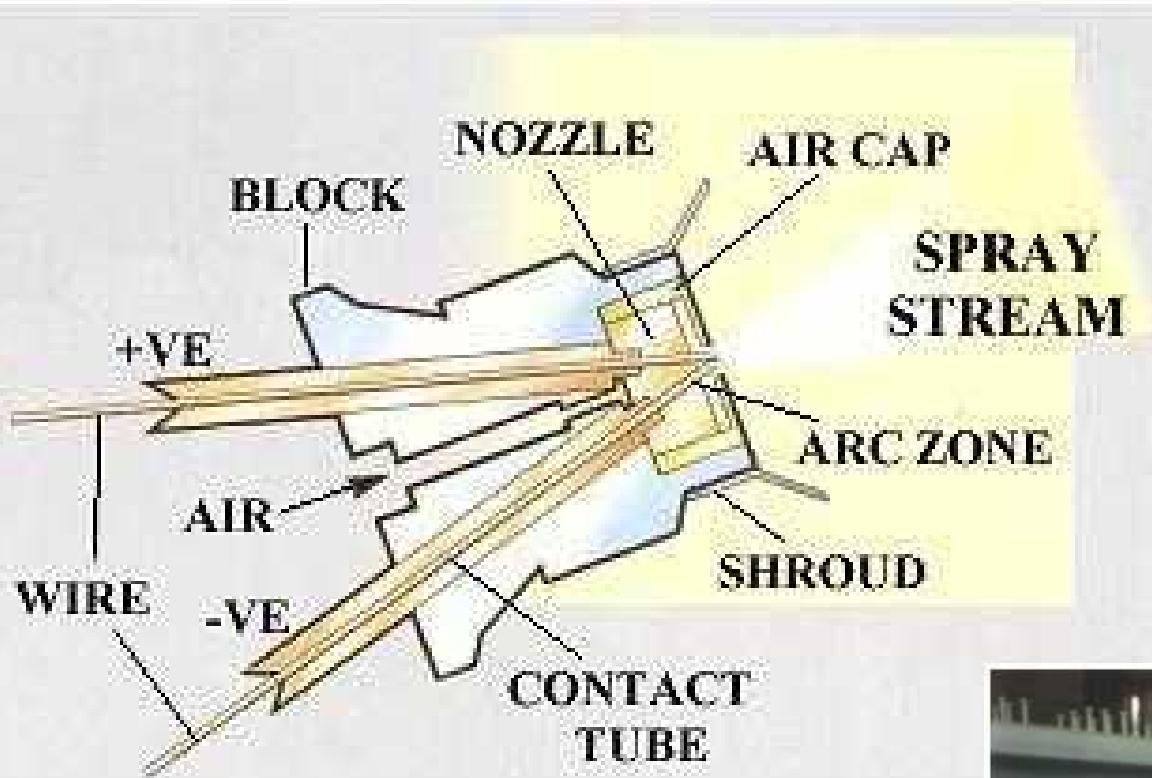
Powder flame

HVOF

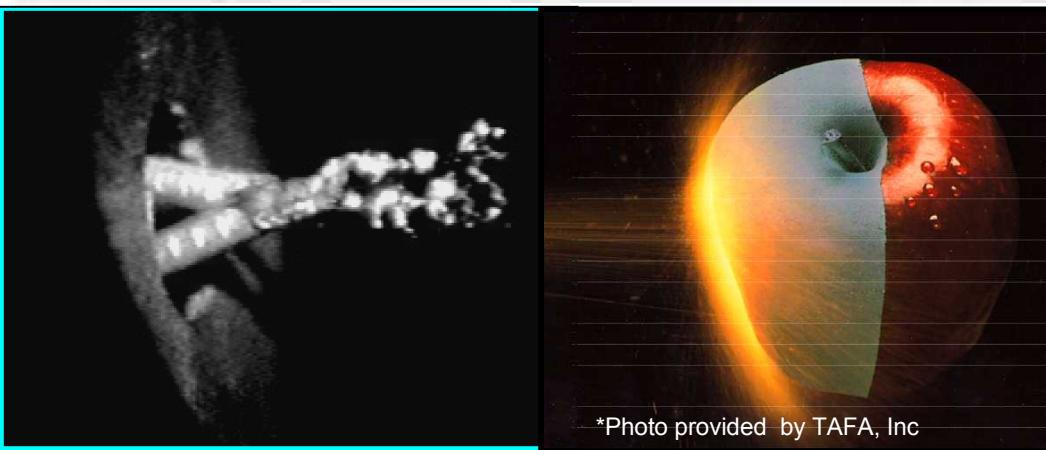
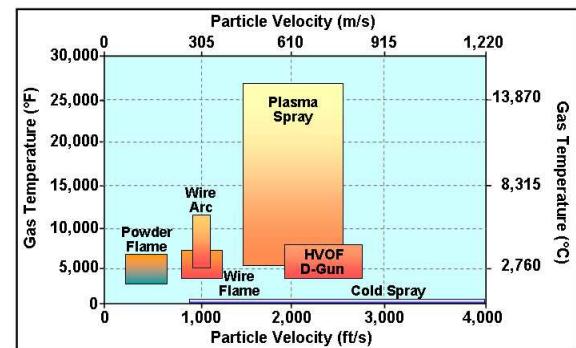
Twin wire arc



Twin Wire Arc Spray

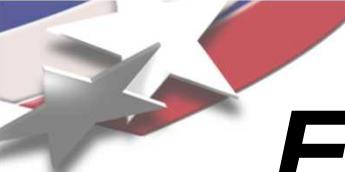


- Low thermal input
- Steel, Cu, Al, & Zn
- Corrosion protection & EM shielding



*Photo provided by TAFA, Inc





EM Shielding using TWA Spray Technology

- Thermal spray allows one to apply low volume, low cost, highly conformable EM shielding to both and small and large parts with complex geometries
- TWA is a robust, mature technology that can be adapted for this work
- TWA sprayed Zn puts very little heat into the part



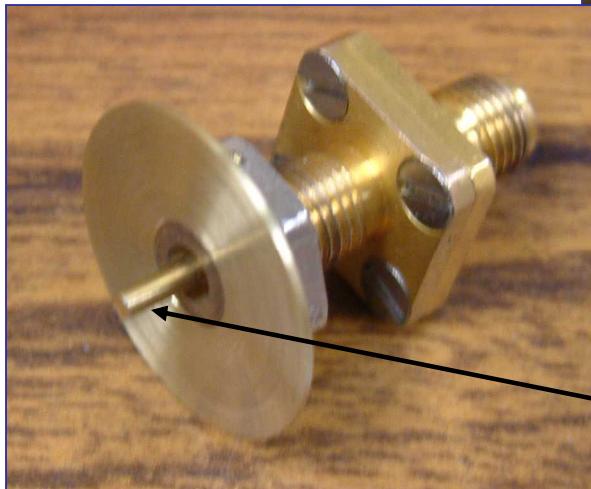
Testing Shielding Effectiveness

- Spray a nylon dummy part
- Place an antenna in the part
- Mount part in Sandia's mode stirred chamber and irradiate the part
- Measure the attenuation



EM Shielding Test Vehicle

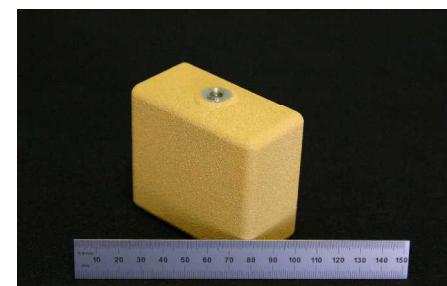
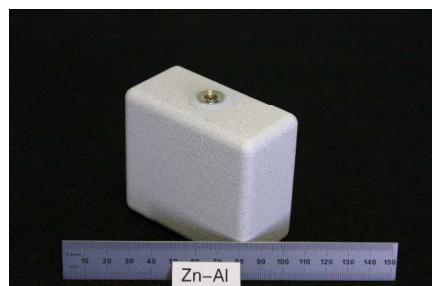
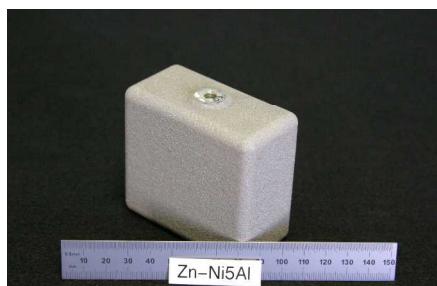
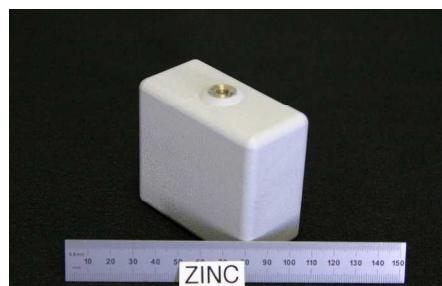
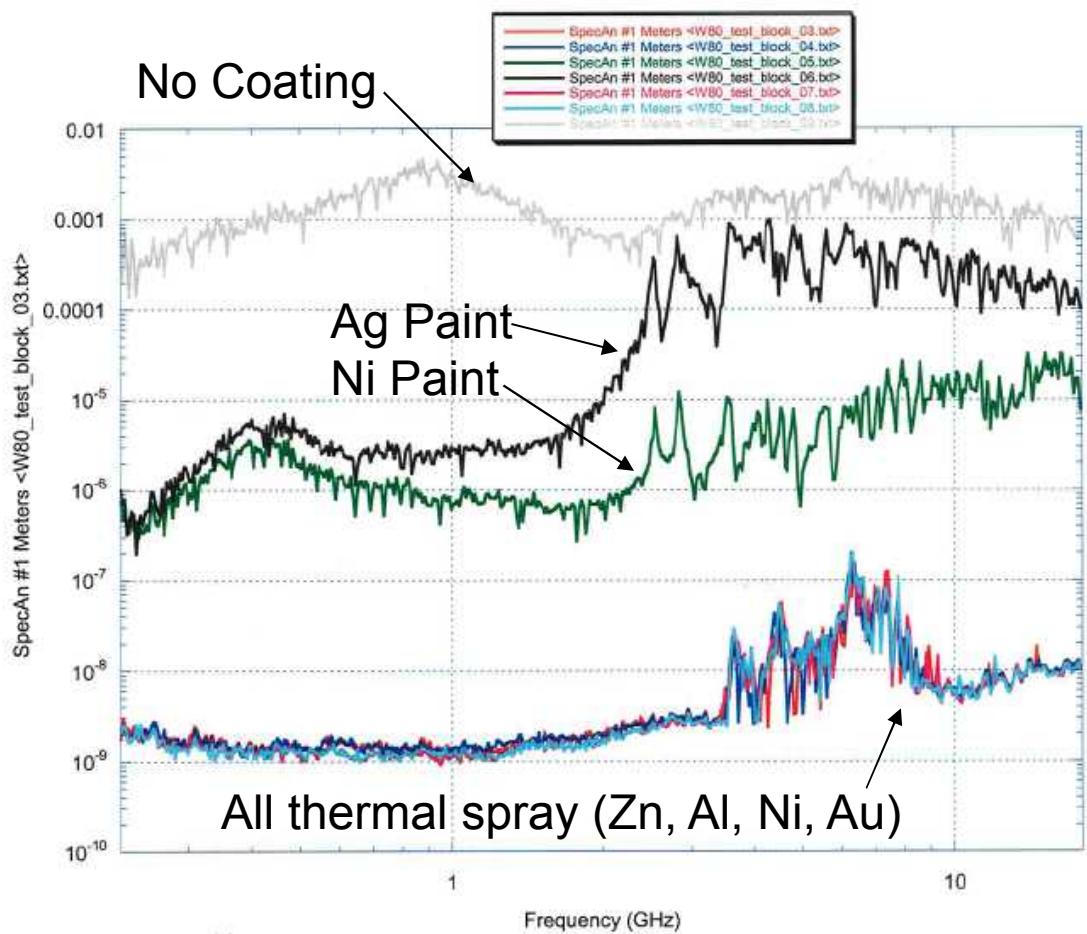
- Nylon block with monopole antenna
- Intended to allow relative comparisons between coatings
- Test vehicle developed



Monopole antenna



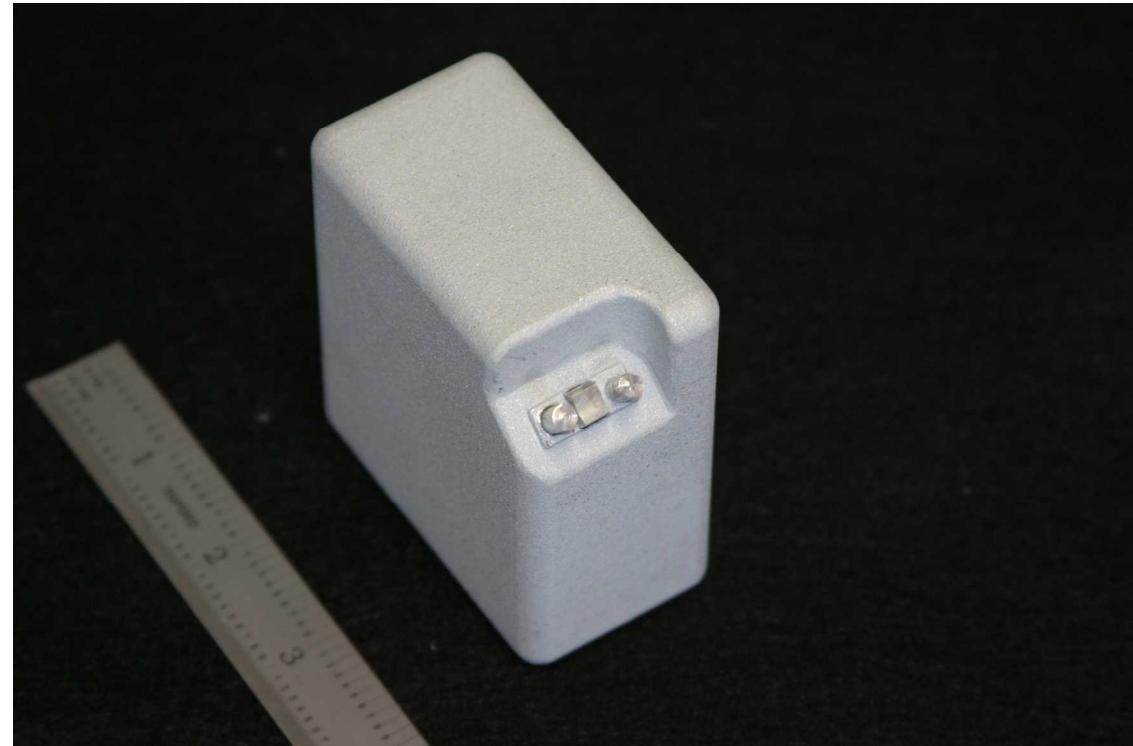
Initial Shielding Tests





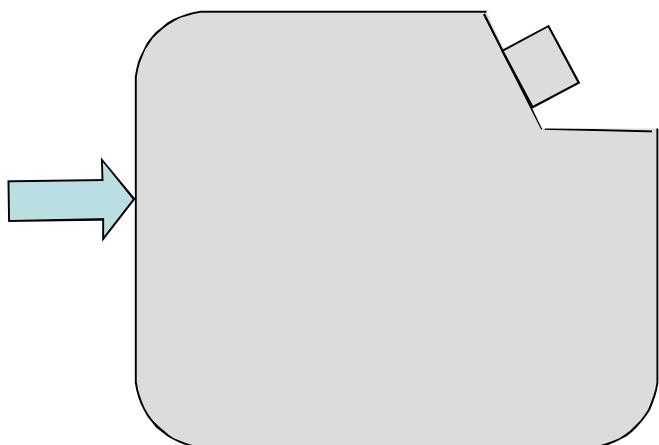
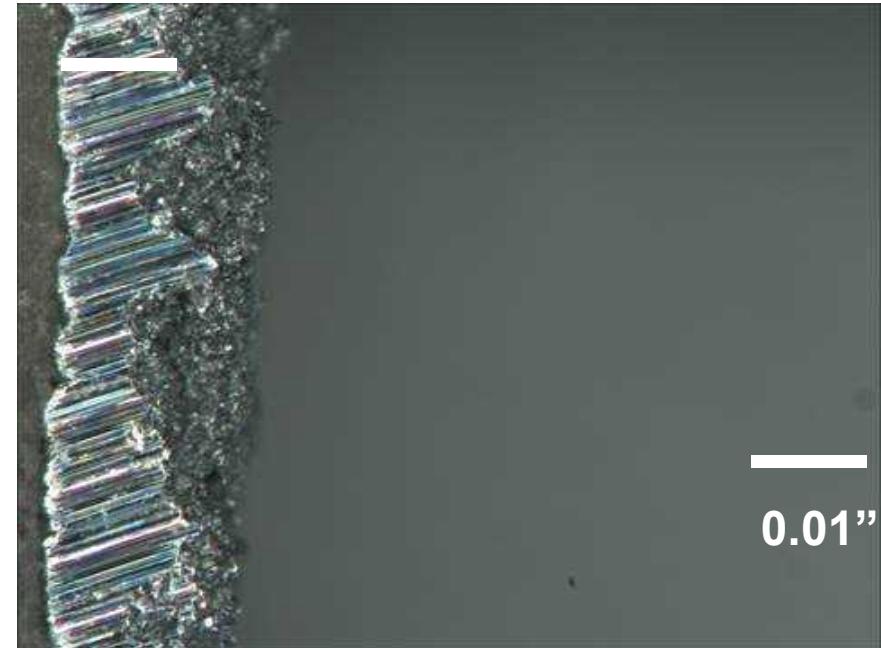
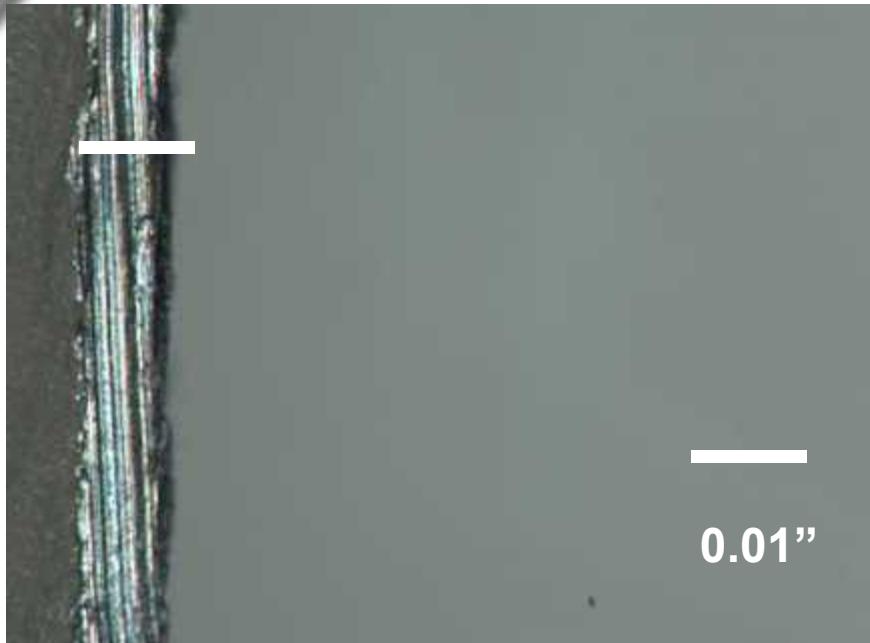
Developing the Process

The process is
being developed
by test spraying
dummy parts
machined from
nylon



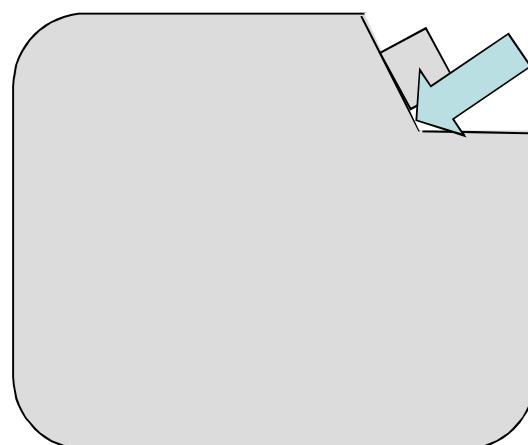


Process Development



45° Spray
without
mask
16 ips
2 passes

Plus whole
coat of 2
passes at
16 ips





Shielding An Actual Part

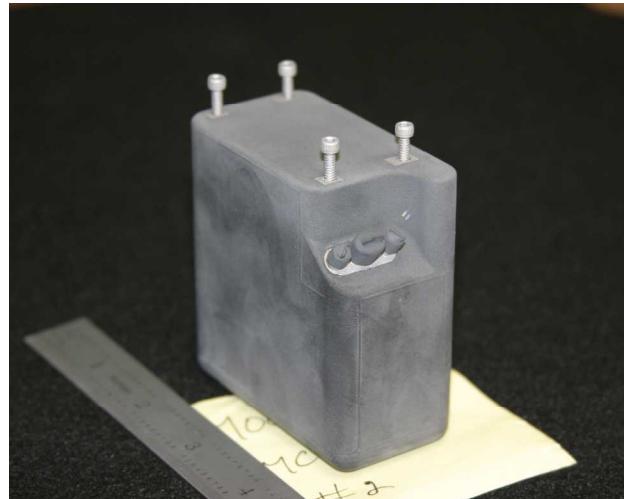


Masked part

Grit blasted
and prepared
for spraying



Finished part





Acknowledgement

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