

Commentary

Spray Metal: An Artist's Perspective¹

Metallizing offers creative options and a cost-saving alternative to bronze casting. Siena Porta explores the field and discusses ways to make the technology more accessible.

In my lengthy search for outdoor sculpture alternatives to casting and welding, one process looked good—thermal spray, an evolving technology that offered creative options, durability and (I hoped) might cost less than metal casting. Swiss scientist Max Ulrich Schoop is credited with inventing thermal spray in 1910, and his new metallizing process was brought to the United States in 1920.

Over the past few years I've developed a working relationship with a research scientist, Professor Herb Herman of the Materials Science and Engineering Department at SUNY Stony Brook. It was his help that allowed me to experiment with this method. Our schedules permitting, I've used a variety of media and have employed the increasingly accessible technology of spray metal as it relates to sculpture.

Another Stony Brook scientist and engineer, Professor Chris Berndt, gave an informal lecture at the exhibition where I first showed spray metal sculpture. He has been researching thermal spray in biomedical engineering as it applies to prosthetic use and showed us a beautifully formed hip joint coated with a ceramic spray. Apparently everything, from airplane wings to dashboards, can be and is being thermally sprayed.

The spray metal electric arc machines I've used are made by Hobart Tafa Technologies Inc. (located in Concord, NH), colloquially known as Tafa. The 9000 System (a two-wire system) is the newest. Apparently

there is another less expensive and lighter spray gun in the making. Air from a compressor with 20-25 horsepower and a capacity of 50 CFM (cubic feet per minute) provides propulsion. Electric arc machines can also be powered with an argon and nitrogen mix, but it's more expensive to keep replacing the gas cylinders than to use a compressor, especially with large volume sprayings.

I spoke to a sculptor who purchased an oxyacetylene Mogul gun in 1965 and is currently spraying and experimenting with spray metal. The drawback with older machines is that they throw a lot of excess heat, which delicate materials don't withstand. Also today's coatings are much more dense, which means less sanding for a smooth finish. However, used equipment may still be a viable option.

With both one- and two-wire arc spraying (feeding one or two rolls of metal through the gun), I've covered materials as divergent as silk, cement, polystyrene, fired clay, acrylic sheet and pigment, mylar, wood and cast resin. One-wire arc spraying differs from two-wire in that it forms a finer, denser coating; it also requires a more expensive machine. A broad range of more durable substrates such as hardware cloth and fiberglass have also been successfully coated with spray metal. Planar shapes are easier to spray than multi-faceted, organic or round forms—especially sculpture in the round—as the molten metal sprays in a straight, slightly diffuse, stream. An even coat creates a stronger shell, which is easily achieved on a flat surface.

Any surface to be sprayed must be as clean as possible to avoid delamination. Oil-based materials, e.g. plastics, need to be sanded or sand-blasted. Fragile materials should be treated with substances such as a tiecoat (a Tafa product) and are initially sprayed with a metal, like zinc, which has a low melting point. This is termed cold spray; the metal melts and is sprayed at a low temperature. Over a zinc coating I've been primarily spraying copper because of the patina possibilities and have been leaving the slightly textured surface unsanded since it appeals to me aesthetically. However, the open metal pores need to be sealed for outdoor installation to prevent delamination from the sculpture form.



Siena Porta, *Untitled*, 1994. Copper over zinc, with fired clay substrate, 23 x 17 x 1.5 inches.

Siena Porta is a sculptor whose work was the subject of a video called "Me & the Mirror."

¹ The commentary "Spray Metal: An Artist's Perspective" by Siena Porta is reprinted by permission from a publication of the International Sculpture Center called "Maquette," and appeared in the May/June, 1994 edition. (Note that the original article has been slightly edited to suit the audience of JTST.)

For sealing thermal spray materials, an air drying phenolic is recommended by Edward R. Novinski, a senior staff engineer for Sulzer Metco, Inc., a leading manufacturer of thermal spray materials and equipment. This, he feels, is the one product most compatible with the sculptor's need for a long-term, durable coating, principally for outdoor installation. It's a clear product, though like all phenolics it will darken slightly and yellow somewhat. If compared to polyesters or urethanes, these drawbacks (discoloration and ultra-violet damage) are much less severe with the phenolic product. Any sealer will alter the sculpture's patina. One of the most interesting effects that the spray metal offers is the color gradation created by two or more metals sprayed on as the surface coat; since each metal patinas or oxidizes differently, the creative opportunities are vast. Acrylic coatings, though clear, will not stand up to weathering caused by temperature changes, salt, or acidity in the environment.

There is also the possibility of spraying into molds, called rapid prototyping. A flexible mold, latex-based or a urethane, can be used, providing it is sealed with a high temperature flat paint and sprayed with a PVA (polyvinyl alcohol) separator. After the metal, usually a zinc alloy, is sprayed into the mold, the substrate can be added; it is brushed on or poured in. This sculpture material can be hydrocal, cement, polyester resin, etc. The major drawback here is that any deep undercuts cannot be sprayed with metal, leaving holes that have to be metallized later. The result is a different surface texture, but finishing techniques can solve this problem.

There are fine art fabricators that metallize, as well as finish and patina, primarily in bronze. The cost is about 1/3 less than most foundry costs, but the final product will usually have a 1/32" to 1/16" coating. It won't have either the strength or permanency that a metal casting will provide, although it is considerably lighter.

Thermal spraying is a fascinating and adaptable technology. Not only does it interface between art and science, it now offers sculptors an even wider variety of artistic and technical choices.

Siena Porta
Sculptor