

Discussion Topics and Threads on Thermal Spray

Compiled and edited by Dr. R.S. Lima, National Research Council of Canada (NRC). These questions and answers were extracted from the discussion group of the Thermal Spray Society of ASM International. The content has been edited for form and content. Note that the comments have not been reviewed. To sign up to the discussion group visit www.asminternational.org. Go to Affiliate Societies, Thermal Spray Society, and under Technical resources sign up for e-mail discussion list—or simply send e-mail to join-tss@maillists.com.

Question 1

Polishing aluminum arc sprayed coatings. I have an application where we are currently arc spraying 5356 aluminum onto a cooling mandrel. For better performance of the end product my customer hand polishes after we machine this coating. They are finding it difficult to put a finish on the coating, and I believe this is caused by the oxide content in the sprayed material. Any suggestion for a material that would have good thermal transfer properties that would still be easily machined and that would be arc sprayed with low oxide content? The base material is cast aluminum, and coating thickness can be as much as .150 in. per side after finish machining.

Answer 1.1: You may try using inert gas such as nitrogen for atomization in place of air or, use diamond grinding with kerosene as coolant to get the finish.

Question 2

Ultrasonic cleaning of TBCs. I recall concerns about performing ultrasonic cleaning of parts that were thermal barrier coated, because the coating could be degraded. I would like to mention that some metallographic preparation techniques include ultrasonic cleaning of the specimens in between grinding/polishing steps. Well, this cleaning also has the potential to degrade the TBC. Are these concerns relevant today? Is there a recommended limit to the power setting of an ultrasonic system used to clean TBC components?

Answer 2.1: Ultrasonic damage can be a concern. The performance of the coating depends on a number of factors. Some variables include:

- Frequency
- Amplitude (power)

- Temperature
- Time
- Cleaning chemistry
- Substrate (including such factors as configuration, surface prep prior to coating, and coating technique)

Of course, newer ultrasonic systems include such factors as sweep, specific waveform, and multiple frequencies in a single tank. These features can impact efficacy of cleaning and substrate erosion. The bottom line is that it is best to test performance using your own product under expected process conditions.

Question 3

Nonstick coatings. We are looking for nonstick coatings based on polymers or any other alternative for nonstick coatings for film rolls.

Answer 3.1: You may want to investigate coatings that contain hexagonal boron nitride.

Answer 3.2: The quasi-crystalline alloys will suit your purpose.

Question 4

Spraying aluminum via VPS. Can anyone give me some advice on spraying aluminum powder by using a VPS system?

Answer 4.1: Handling of aluminum dust can be very dangerous if special precautions have not been taken. I may be wrong, but opening of a VPS chamber door to the atmosphere after a spray run could be dangerous.

Question 5

Stripping WC-Co coatings. We are involved in mold maintenance activities where previously coated surfaces on the moulds need to be stripped prior to maintenance and recoat. We use an HVOF spray system and the powder is WC12%Co. At present we use sodium citrate bath to electro strip, and the time taken is about 2 h. The coating thickness is in the range of 25 to 125 μm . Can anyone help me in this area especially to speed up the stripping process?

Answer 5.1: You can find the Rochelle salt strip method in SAE ARP5935. It works well for this style of coatings.

Question 6

High coefficient of friction coating. Is anyone familiar with high coefficient of friction plasma sprayed coating? The application is for centrifugal clutch: 150 mm diameter, 25 to 30 mm width, and the coating should be on the internal diameter.

Answer 6.1: Usual requirements for clutch surface include:

- Low coefficient of friction at low loads
- High coefficient of friction at high loads
- Relatively good thermal conductivity

Metal-ceramic composites work rather well for such applications. I had a success spraying Ni-12Cr-8W-2B-4Si/Al₂O₃ blends. Coating surface buffered to about 100 μin . R_a .

Question 7

Degreasing Operation. I am looking for recommendations for a degreasing operation. We want to degrease oily 1018 parts. This is a start-up, and there is no hot water available. We are looking for something that we can dip the part into and rinse in a second tank. We do not want to pay to carry off the remnants. It does not have to be water based.

Answer 7.1: Certified labs have two water-based degreasers, Aqua Solve and Certi-Etch. I suggest using a tank and heater to heat the bath since hot water is not available. Also use pumps and spray nozzles to assist.

Question 8

Safety precautions during thermal spraying. I am searching for some published material on safety precautions during thermal spraying; particularly in LPPS (low-pressure plasma spray), APS (air plasma spray), and HVOF (high-velocity oxyfuel).

Answer 8.1: The Thermal Spraying and Surface Engineering Association (TSSEA) in the United Kingdom have published a code of practice for the safe installation, operation, and maintenance of thermal spray equipment that is available on their website (www.tssea.co.uk).