



Alumina Coating Process Fit for Service in Space

A nanoceramic alumina coating process for aluminium printed circuit board (PCB) components was presented by Cambridge Nanotherm Ltd at the recent Electronic Materials and Processes for Space (EMPS) workshop which took place in April 2015 at the German Space Operations Centre near Munich, Germany.

Giles Humpston, Field Applications Manager at Suffolk-based Cambridge Nanotherm Ltd, opened proceedings with his company's nanoceramic alumina coating process for aluminium printed circuit board (PCB) components, which enhances the material's thermal and electrical properties.

Established methods for applying alumina coatings to a metal, such as anodising, plasma electrolytic oxidation and spray coating can already produce effective mechanical coatings. But their high surface roughness, low breakdown voltage and unpredictable deposition make them unsuitable for electronic applications.

Rather than simply coating, Nanotherm's process converts the surface of aluminium



itself into alumina, through electrochemical processing in an electrolytic cell filled with a benign alkaline solution, which can be safely disposed of down the drain. 'It's important to mention that this is a green technology,' said Humpston – 'one of the company's founders demonstrated that it's safe by putting a cup into the tank and drinking it, and he's still alive!'

The resulting nanoceramic material maintains the robust mechanical properties of aluminium, but with thermal performance comparable with aluminium nitride – the

boards survived thermal cycling from -40°C to 250°C without degradation, and PCBs with a thermal conductivity of 152W/mK can be manufactured by adhering copper foil to the top surface of the converted aluminium, Humpston said. 'It's alumina, but not as you know it', he said. The composition of the nanoceramic layer is affected by the other elements present in the aluminium alloy, with chemical differences visible in the material's colour – a purer grade produces an ivory finish, while alloys containing copper can be almost jet-black.

North American Scrap Prices Declined



The North American Aluminum scrap prices declined on Scrap Monster Price Index as on June 30th. 1100 Scrap prices declined by \$0.01 per Lb. The prices of 3003 Scrap too fell \$0.01 per Lb. A down move of \$0.01 per Lb was witnessed in 356 Aluminum Wheels, 5052 Scrap, 6061 Extrusions, 6063 Extrusions and 6063 Extrusions/Fe.

The prices of Al/Cu Radiators and Al/Cu Radiators/Fe declined by \$0.03 per Lb over the previous day. Aluminum Radiators and Aluminum Radiators/Fe prices went down by \$0.01 per Lb each. Aluminum Transformers and Breakage 50% Recovery prices edged lower by \$0.01 per Lb.

3D Metal Car Accomplished New Technology



A car on display in San Francisco is being used as a showcase for what can be done with 3D metal printing. The car is very light at just 1,500 pounds – less than half the weight of a Tesla, and also features a 700 horsepower engine that runs on either gasoline or natural gas.

Kevin Czinger, founder of Divergent Micro Factories believes the technology will revolutionize manufacturing. "If we don't find a way to radically reduce the materials and energy we use, we are going to blow

ourselves up," Czinger said.

The key to produce the complicated parts starts with metal powder. Lasers melt a thin layer of the powder in precisely the right shape before another layer of powder is applied. The process is repeated over and over until the finished piece is produced.

"The object of this is to put tools into people's hands. Small teams that can get together and use this on a sophisticated industrial level," Czinger said. The cars won't be available for at least a few years.