**NOVEL CLADDING TECHNOLOGIES OF THERMAL NANOPARTICLES SPRAYING AND MICROLINES PATTERNING**

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Thermal nano coating and micro patterning were newly developed as novel technologies to create fine metal or ceramics layers and geometrical intermetallics patterns for mechanical properties modulations of steel substrates. Nanometer sized tungsten or alumina particles of 300 nm in average diameter were dispersed into liquid resins at 40 % in volume fraction, and the obtained slurries were sputtered by compressed air jet of 2 atm in pressure. And, the slurries mists were blew into the arc plasma with argon gas spray of 50 slpm in flow late. On the steels substrates, the fine surface layers of 30 μm in thickness with high wear resistance were formed at 300 gpm in supply rate. Subsequently, pure aluminium particles were dispersed into the photo solidified liquid resins at 40 % in volume fraction, and the slurry were spread on the stainless steel substrates with 50 μm in layer thickness. On the steels substrates, micro patterns with fractal structures were drawn and fixed by an ultra violet laser scanning of 100 μm in spot size. The patterned pure metal particles were heated by the argon arc plasma spraying, and the intermetallic or alloy phases with high hardness were created through reaction diffusions. Microstructures and compositional distributions in the coated layers and the patterned lines were observed and analyzed by using a scanning electron microscopy and energy dispersive x-ray spectroscopy. The mechanical properties and surface stress distributions were measured and simulated by a tensile stress test and finite element method.