

## High Emissivity and Corrosive Protective Ceramic Coatings Formed on Light Metals by Microarc Oxidation

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**Abstract** Light metals (Al, Mg, Ti alloys *et al*) are widely used as heat exchanger and radiator for aerocrafts, internal combustion engines and electronic device (3C products). To improve the thermal radiative and corrosion resistance properties of light metals (Al, Mg and Ti alloys), the high emissivity ceramic coatings were designed on the metals surface by microarc oxidation (MAO) method. The effects of uncoated and MAO coated metals on infrared emissivity, heat dissipation and corrosion resistance properties were comparatively investigated. The results show all the compact MAO ceramic coatings significantly promote the corrosion resistance. More importantly, the MAO coated Al, Mg and Ti alloys exhibit a high emissivity up to 0.8, while the values are only 0.1-0.3 for the metals substrate. The SiC particles doped MAO coating enhance the spectral emissivity value, especially in the wavelength of 3-8  $\mu\text{m}$ . The heat dissipation results indicate that the MAO and SiC doped MAO coated aluminum alloy enabled a significant IGBT junction temperature ( $T_j$ ) drop by 7.3  $^{\circ}\text{C}$  and 9.6  $^{\circ}\text{C}$ , respectively. Compared with the uncoated magnesium radiator, the MAO coated samples enable the junction temperature of IGBT to drop approximately at 7.3  $^{\circ}\text{C}$ . The  $T_j$  drop is 8.2  $^{\circ}\text{C}$  for MAO coated titanium alloy. MAO method is expected to be a promising candidate for heat dissipation applications.