Effects of addition of vanadium(IV) oxide sulfate hydrate on aluminum coatings by AC plasma electrolytic oxidation

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The objective of this work is to investigate the addition effect of the vanadium(IV) oxide sulfate hydrate in sodium silicate electrolytes solution on the Al2O3 coating layers by AC plasma electrolytic oxidation(PEO). The aluminum 3102 was used as substrate for the PEO coating with constant current density and time. The morphology, structure, and surface composition of the coating layers were characterized using scanning electron microscopy (SEM), X-ray diffractometer (XRD), and energy dispersive spectroscopy (EDS). The mechanical strength and corrosion resistance of the coating layers were measured with microhardness and potentiodynamic polarization analysis. The mechanical strength and corrosion resistance was significantly increased by the addition of vanadium(IV) oxide sulfate hydrate in electrolyte, which was attributed to the formation of crystalline Al2O3 and vanadium oxide in coatings layer.