

Surface nitriding of aluminum using barrel and its applications

Wednesday, 7 September 2022 15:10 (25 minutes)

A passivation layer is present on the aluminum surface, and Al has a better affinity for oxygen than nitrogen so generation of aluminum oxide is easier than with aluminum nitride (AlN). Therefore, it is difficult to form the AlN on aluminum surface below the melting point. However, gas nitriding of aluminum is possible by using the barrel nitriding in which the oxygen partial pressure in the atmosphere is reduced and the passivation layer on the surface is polished with heating in nitrogen atmosphere. Scanning electron microscopy (SEM) is used for thickness measurement and structure observations of the modified layer. X-ray diffraction analysis (XRD) is carried out to characterize the constituents of the modified layers. The distribution of nitrogen, oxygen Al and magnesium in the modified layer is analyzed by electron probe micro analyzer (EPMA).

A nitrided layer of several hundred micrometers can be formed on the aluminum substrate by using the barrel nitriding, and its hardness is about 600 HV. The chemical composition of the aluminum alloy affects the formation of the nitrided layer. Magnesium promotes the formation of a nitride layer, and silicon prevents the formation of a nitride layer.

This method is also applicable to aluminum powder, and aluminum powder with a diameter from 75 to 125 micrometers can be nitrided uniformly. By mixing AlN powder nitrided by the barrel method with the resin, the thermal conductivity of the resin can be improved.

Speaker Country

Japan

Register for the Tom Bell Young Author Award (TBYAA)?

No

Primary authors: OKUMIYA, Masahiro (Toyota Technological Institute); Dr NAMBU, Koichiro (Osaka Sangyo University); Dr YOSHID, Masashi (Daido University); Dr KIM, Sang-gweon (Korea Institute of Industrial Technology); Dr KONG, Jung-Hyun (Toyota Technological Institute)

Presenter: OKUMIYA, Masahiro (Toyota Technological Institute)

Session Classification: SURFACE ENGINEERING

Track Classification: Thermochemical treatment (carburizing, carbonitriding, nitrocarburizing, nitriding)