# Surface Modification of Aluminum Alloys

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As a 6061 aluminum alloy has both high strength-to-weight ratio and good corrosion resistance, it is used for automobile parts or motorbike parts. In finish cutting at small feed rate, it has a bad influence on the cutting operation because of continuous chips. Usually, Pb and Bi are added in order to break the continuous chips. The chips become brittle because Pb or Bi, which has low melting point, is dissolved by cutting heat, and the chips are broken easily. Therefore, free-machining aluminum alloys such as 6262 aluminum alloy, contains 0.4 ～ 0.7%mass percent Pb and Bi, are widely used. However, the use of Pb will be prohibited from the standpoint of the environmental protection on the earth, and it is necessary to improve the chip breakability without adding Pb.

In this study, in order to clarify the suitable Si contents from the standpoint of both machinability and the coatings-substrate system, two kinds of Al-Si alloys based on the 6061 aluminum alloy (0.7 mass% Si) were used as substrate. In turning of three kinds of aluminum alloys, the chip configurations and tool wear were investigated. Furthermore, the influence of the Si contents on the coatings-substrate system is also investigated. The scratch cracking delamination of the coated aluminum alloy is measured with the CSM Scratch Tester, and the friction coefficient is measured with the CSM Tribometers.

The main results obtained are as follows:

(1) As compared the configuration of the Al-2%Si alloy with that of the Al-4%Si alloy, the chip length of Al-2%Si alloy became slightly longer than that of Al-4%Si alloy in the case of the feed rate 0.15 mm/rev. However, it seems that there was little remarkable difference between two kinds of Al-Si alloys at the feed rate above 0.2 mm/rev.

(2) The wear progress became faster with the increase of Si contents. As compared the configuration of the Al-2%Si alloy with that of the Al-4%Si alloy, the wear progress of Al-2%Si alloy became considerably slower than that of Al-4%Si alloy.

(3) The delimitation point force of coated Al-2% Si alloy with the alumite layer was high.

(4) The friction coefficient of the coated Al-2% Si alloy increased with the alumite layer was low.

(5) In the surface modification of aluminum alloys which contain Si, this combined surface treatment method can become new surface modification method owning to excellent adhesive strength.

(6) As mentioned above, it seems that the most suitable Si contents was 2% from the standpoint of both machinability and surface modification of aluminum alloys.

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