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Evaluation of Bake Hardening Behaviour of New CaO-added Al-Mg-Si alloys

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The application of the aluminum alloy has become very extensive in the transportation industries. The aluminum alloys have been widely used in the manufacturing of the aircraft skin because of their excellent performance, such as high specific strength and high specific stiffness. Aluminum sheet for automobile body-in-white application have been used since the early days of car and aluminum production. In the time of increasing mass production and low cost priorities, however, steel has taken over the lead. But increasing fuel prices, CO_2 regulations and additional comfort and equipment loads lead to a strong tendency for light weighting.

An obstacle to broader implementation of aluminum alloys in transportation industries is the superior formability of less costly steel alloys. Enhancing the strength, formability, corrosion resistance and surface appearance of the aluminum alloys have been conducted by variations in chemical composition and processing. Magnesium(Mg) is currently one of the main alloying elements in an aluminum alloys. The addition of Mg increases the strength, makes the alloy favorable to surface treatment, and improves corrosion resistance. However, there is a problem in that the oxide protection gas such as SF6, which is not only expensive gas but also a gas causing an environmental problem, may be used during the addition of magnesium[1]. Recently, Kim et al. [2] invent aluminum alloys which manufactured in an environment-friendly manner and have excellent properties by containing a calcium(Ca)-based compound.

In this paper, the bake-hardening behaviour of new CaO-added Al-Mg-Si alloys, which is so-called ECO Al-Mg-Si alloys for automotive body under different artificial ageing processes are evaluated comparatively. Especially, the effect of the pre-aging[3] and pre-straining[4] on the bake-hardening process are investigated to improve tensile properties of the ECO Al-Mg-Si alloys. Based on the experimental results, the optimum process condition for the bake-hardening process are obtained.

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