STUDY OF THE DEVELOPED NANO-SCALE PRECIPITATES IN AF/C 489 ALLOYS BY USING DSC AND SEM TECHNIQUES

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Abstract:

In the present article, kinetics of the clustering processes in AF/C489 Alloy in the early stages of aging was probably contributed by coalescence of Cu-vacancy, Li-vacancy and Zn-vacancy complexes to form Li-Cu-Zn-vacancy clusters. The high value of the activation energy indicate that the driving force of the clustering process is high. In Li-containing aluminium alloy, preferential clustering of lithium-vacancy pairs is thought to occur during solution treatment and quenching, since lithium possesses a higher vacancy binding energy than zinc or magnesium does. The diffusion of Zn and Mg atoms is slowed down because of preferential formation of Li-vacancy aggregates in the alloy, when Li atoms are present in the form of solution. The activation energy associated with the precipitation of the θ′ phase was found 61.63 kJ mol−1. Accordingly, the mechanism of the precipitation of θ′ (Al2Cu) phase controlled by both migrations of Li and Cu atoms in the Al matrix. Vacancies bound to lithium atoms make it difficult for diffusion or aggregate to grain boundaries, this is one of the main reasons of forming narrow precipitate-free zones in present Li-containing alloy. The results evidently indicate that Li atoms slow down the diffusion of Zn and Mg atoms and vacancies, and thus the segregation of them to grain boundaries has been restricted. The micro hardness was found to increase as a result of the precipitate of δ′ (Al3Li) and T1(Al2CuLi) precipitates.

Keywords:

AL-Li AF/C 489, Micro hardness, DSC, δ′-Phase, θ′ Precipitates, T1-Phase

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