EFFECT OF THE COLD- ROLLED ON THE PRECIPITATION MECHANISM OF S´ PHASE IN Al_{2024} ALLOY

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Al_{2024} alloy possesses high strength, so that is widely used as a light structural material in aerospace and military industries [1]. The strengthening of the alloy can occur by the precipitation of the S´ phase, but their formation depends on the processing conditions and chemical composition of the alloy. Therefore, the aim of this research is to determine the effect of cold- rolled on the precipitation mechanism of S´ phase in Al_{2024} alloy. As a consequence, it would be expected that different morphology of S´ precipitates will be obtained and that the strengthening and precipitation mechanism to be modified. Commercial Al_{2024} alloy was used as raw material and was melted in a Lindberg Blue^{TM} electric furnace at 740 °C. Subsequently, the samples were subjected to a hot- extrusion process and a solution heat treatment (SHT). Finally, samples without deformation and cold rolled to 30% reduction thickness were prepared, and aging heat treatments (AHT) were carried out. Before and after of the AHT, Vickers microhardness test was performed in a LECO LM300AT hardness tester using 50g load and 10s of dwell time. The samples were analyzed in TEM mode using a transmission electron microscope JEM 2200 FS + CS operated at 200 kV. The microhardness graph showed that the maximum HV value for not deformed samples occurs at 300 min (208 HV ± 3.6). In contrast, for the same aging time, HV value (217.08 HV ± 8.3) was obtained for cold- rolled samples. The TEM- SAED suggested that in a sample not deformed high density of S` precipitates in the aluminum matrix are present, showing half crosses located around the forbidden $\{110\}_{Al}$ reflections. In addition, stronger streaking connecting habit planes (200) (020), (- 220) (2- 20), (- 200) (0- 20) and streaks parallel to [100] matrix direction are observed. Instead, the TEM- SAED of the cold- rolled samples also shows half crosses around the forbidden $\{110\}_{Al}$ reflections, but not streaking are observed in habit planes. The stronger re?ections the forbidden $\{110\}_{Al}$ can be explained by {112}, {131} and double diffractions [2]. The different morphology observed could explain the variation in microhardness at 300 min aging time.

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