MECHANISM OF STATIC PRECIPITATION IN COLD ROLLED Al_{2024} ALLOY

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Al_{2024} alloy is a structural material used in the aircraft industry. Its properties can be influenced by the grade of deformation applied which generates increase in the density of dislocations that contribute in modifying the precipitation sequence and the microhardness of the material during the aged stage. In this sense, the aim of this research is to determine the mechanism of the static precipitation in the aging process of the Al_{2024} alloy deformed to 30% reduction. It would be expected that the phases obtained increasing the microhardness to short time of aged to comparison with samples not deformed. Commercial Al_{2024} alloy was used as raw material and was melted in a Lindberg Blue™ electric furnace at 740 °C. Specimens obtained were extruded at 465°C and further was performed a solution heat treatment (SHT) at 495 °C for 420 min followed by quenching in water at 60 °C. Samples without deformation and cold rolled to 30% reduction thickness were prepared. Aging heat treatments (AHT) to different aging time were performed in a Felisa™. Before and after of the AHT Vickers microhardness test were carried out in a LECO LM300AT hardness tester using 50g load and 10s of dwell time. Later the samples were characterized by X-ray diffraction (XRD) using Panalytical X'Pert PRO diffractometer operated at 40 kV and 30 mA using Cu $K_?$ radiation (? = 0.15406 nm). The curve of microhardness for deformed samples indicated double-peak age strengthening: The first peak achieved to aging time of 30 min (248 ± 4.7 H_V) and the second peak to 600 min (226 ± 8.3 H_V). In contrast, the microhardness curve for not deformed samples only showed one peak age strengthening formed to 300 min (208 ± 3.6 H_V). Results by DRX diffraction suggest that for samples cold rolled, the high value of Vickers microhardness in the first peak strengthening is attributed mainly to the phases Al_2Cu, AlCuMg and Al_2CuMg. The Vickers microhardness value in the second peak strengthening is due to Al_2Cu. In the case of not deformed samples DRX patterns showed that the peak strengthening occurs due to the phase Al_2CuMg.

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