STUDY THE INFLUENCE OF PRECIPITATE SIZE DISTRIBUTION ON HARDNESS OF ALUMINIUM 6063 ALLOY UNDER CONSTANT AGING TEMPERATURE

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Degree of Master of Science

Department of Materials Science and Engineering

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Thesis/Dissertation Submitted in Partial Fulfillment of the Requirements for

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DECLARATION

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Name of the Supervisor: Dr. G.I.P.De Silva

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ABSTRACT

The improvement of mechanical properties of heat-treated (T6) Aluminium 6063 alloy is caused due to hindrance of the dislocation line by the precipitates which is formed during the heat treatment process. The perception of the inter-relation between microstructural variations and mechanical properties with process parameters is essential, as it facilitates the optimization of the processing routes of the industry to be profitable. Several combinations regarding the relationship between properties and process parameters developed in previous studies without considering the precipitate size distributions. The current research focuses on finding the influence of age hardening process parameters on the precipitate size distribution and its effect on the hardness of the final product.

Prepared samples were solution treated and quenched in water, followed by aging treatments for different periods. The Scanning Electron Microscope (SEM)/ Energy Dispersive Spectroscopy (EDS) analysis of precipitates was used to identify the Fe-Si-rich and Fe-Si-Mg-rich precipitates/β phase in the matrix (α phase). Further analysis of precipitates was done through IMAGE J software and MS EXCEL. The change of precipitate size distribution with different soaking times and its effect on the hardness of the Alloy was studied. A significant decrease in hardness was witnessed when the particles coarsen above 1.5 μm, for the aging time beyond 270 min at 190^0C.

Keywords: *Al 6063, Age hardening, Hardness, Precipitate size distribution*

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LIST OF ABBREVIATIONS

IMAGE J	Java-based image processing program
EHT	Event Horizon Telescope
HB	Brinell Hardness
EDX	Energy Dispersive X-Ray
TTP	Time Temperature Property