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COMPARATIVE ANALYSIS OF TENSILE STRENGTH IN EN-AW 7075 ALUMINUM ALLOY: EMPIRICAL VS. THEORETICAL ASSESSMENT

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Abstract

The tensile strength and hardness of materials are properties which show strong correlation. Both represent critical parameters in engineering and material science. Our study aims to compare empirical and theoretical results, providing insights into the accuracy of theoretical predictions for tensile strength of EN-AW 7075 aluminum alloy under different conditions. In this study, the tensile strength of given aluminum alloy is investigated under: annealed (Temper O), aged (Temper T6), pre-deformed (Temper T8) and post-deformed (Temper T9) condition. The empirical results revealed a significant variation for different conditions, with values of 370 MPa, 506 MPa, 595 MPa, and 651 MPa, respectively. To complement the experimental findings, the theoretical tensile strength of the alloy was calculated based on Vickers hardness measurements using equation presented in M. Tiryakioğlu's work. Measured hardness values were: 91 HV_{15} for annealed, 158.5 HV_{15} for aged, 180.5 HV_{15} for pre-deformed and 198.2 HV_{15} for post-deformed samples. The calculated values of tensile strength were found to be 334 MPa, 497 MPa, 551, and 593 MPa, respectively. Relative differences between experimental and theoretical results for given conditions are 10.78%, 1.81%, 7.99%, 9.79%. The findings not only contribute to our understanding of material behavior but also have practical implications in various engineering applications. This research highlights the importance of considering both experimental and theoretical approaches when assessing material properties, offering valuable lessons for future materials science investigations.

***Keywords**: EN-AW 7075, Aluminum, Tensile strength, Hardness, Comparative study*

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