4. Results and Discussion

4.1 Results

The tensile strength of the tested alloy samples was measured and summarized in Table 1. The average tensile strength increased with the addition of 2% copper, achieving a maximum value of 475 MPa at 4% copper content.

Sample	Copper Content (%)	Tensile Strength (MPa)
A	0	410
B	2	450
C	4	475
D	6	460

The hardness values followed a similar trend, with a peak at 4% copper. Figure 1 demonstrates the relationship between copper content and tensile properties.

4.2 Discussion

The results indicated a direct correlation between copper content and enhanced mechanical properties up to a certain threshold. The increase in tensile strength can be attributed to solid solution strengthening caused by copper atoms in the alloy matrix. However, beyond 4%, a slight decrease was observed, potentially due to over-saturation and the formation of brittle intermetallic compounds.

Compared to previous studies (Smith et al., 2020), the observed improvements are consistent with literature, reinforcing the positive impact of moderate copper additions. Deviations at higher concentrations may result from variations in alloy processing or the presence of impurities.

These findings are significant for the design of lightweight structural components requiring optimized strength-to-weight ratios.

4.3 Limitations

The study was limited to room temperature tensile tests; future work should assess temperature effects. Microstructural analysis was not conducted, which may have provided more insight into phase transformations.

Important Notes:

- Clearly separate results (objective observations) from discussion (interpretation).
- Use tables and figures to summarize and display data effectively.
- Relate your findings to previous research whenever possible.
- Discuss limitations and suggest areas for further study.
- Support discussion points with quantitative evidence from your results.