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REVIEWER'S REPORT

Manuscript No.: IJAR-55874

Title: MICROSTRUCTURE AND MECHANICAL BEHAVIOR OF 17-7PH STEEL WITH MODIFIED CHEMICAL COMPOSITION AFTER NATURAL AGING.

Recommendation:

Accept as it is .....

Accept after minor revision.....

Accept after major revision ...**Yes**.....

Do not accept (*Reasons below*) .....

Rating	Excel.	Good	Fair	Poor
Originality			**Fair**	
Techn. Quality			**Fair**	
Clarity			**Fair**	
Significance			**Fair**	

Reviewer Name: Prof. Dr. R. Hema Krishna

Detailed Reviewer's Report

The manuscript investigates the effect of modified Cr, Ni, and Al contents and different solution annealing temperatures on the microstructure and mechanical properties of 17-7PH precipitation-hardening stainless steel after long-term natural aging and TH1050 treatment. The topic is technically relevant to materials science and metallurgical engineering, particularly for automotive and high-performance structural applications. However, the manuscript in its current form suffers from significant scientific, methodological, and presentation weaknesses. While the study addresses a relevant topic and includes valuable long-term aging data, the manuscript does not currently meet the scientific rigor, analytical depth, and presentation quality required for publication. Substantial revisions are necessary before reconsideration.

1. Abstract

The abstract is poorly written and grammatically weak, with unclear sentence construction. Quantitative results are missing (no key strength values, % improvement, or comparison metrics).The novelty of modifying Cr, Ni, and Al contents is not explicitly justified. The abstract reads more like a general description than a scientific summary.

2. Introduction

The introduction is too brief and superficial. Literature review is insufficient and outdated, relying heavily on the authors' own previous work. There is no clear research gap or hypothesis articulated. The motivation for narrowing the Cr, Ni, and Al composition range is not scientifically justified using phase diagrams or prior studies. The manuscript does not convincingly explain why this study is necessary beyond routine characterization.

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3. Experimental Methodology

Chemical composition justification is weak: Chromium content is below EN 10088-5 limits, yet the implications on corrosion resistance and phase stability are not addressed. Sample size and number of replicates are not reported, raising concerns about statistical reliability. Cooling rates after solution annealing are not clearly specified. No uncertainty, standard deviation, or repeatability data are provided for mechanical testing. The methodology lacks transparency and reproducibility.

4. Results Presentation

Tables are overcrowded and difficult to interpret, especially Table 2. The comparison between natural aging (2015 data) and TH1050 treatment (2025 data) is confusing and not systematically discussed. Elevated temperature results (425°C) are reported, but their engineering significance is not explained. Figures 4 and 5 (microstructures) are presented without quantitative phase analysis. Results are descriptive rather than analytical.

Micro structural Analysis: Only optical microscopy is used. No quantitative measurements of martensite, retained austenite, or δ-ferrite volume fractions. No SEM, EDS, XRD, or TEM analysis to confirm: Precipitated intermetallic phases. Carbide type ($Cr_{23}C_6$ is assumed but not experimentally verified). Microstructural claims are speculative and not rigorously supported.

5. Discussion

The discussion section contains repetition of sentences and paragraphs, indicating poor editing. Cause–effect relationships between composition, heat treatment, microstructure, and properties are not deeply analyzed. The role of Ni in stabilizing austenite and its impact on martensitic transformation is mentioned but not critically explored. Comparisons with published literature are minimal and weak. The discussion lacks scientific depth and critical insight.

6. Conclusions

Conclusions largely repeat results rather than synthesize new understanding. Claims about precipitation of inter metallic phases and carbides are not experimentally proven. Industrial implications are stated but not quantified. Conclusions are overstated relative to the evidence provided.

7. Specific Suggestions for Improvement

Rewrite the abstract with clear objectives, methods, key numerical results, and conclusions.
Expand the introduction with a critical literature review and clearly defined research gap.
Justify the modified chemical composition using phase stability arguments.
Provide statistical treatment (mean ± SD) for mechanical properties.
Include advanced characterization (SEM/XRD) to validate precipitation and phase claims.
Quantify microstructural features (phase fractions, grain size).
Remove duplicated text and substantially revise the Discussion section.
Improve English language quality through professional editing.
Clearly distinguish between new findings and previously published results.
Reorganize tables and figures for clarity and readability.
Insufficient references, Additional references are needed, Arrange references as per journal style