



e-ISSN: 2319-8753 | p-ISSN: 2347-6710

# IJIRSET

International Journal of Innovative Research in  
**SCIENCE | ENGINEERING | TECHNOLOGY**

# INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

Volume 12, Issue 4, April 2023

**ISSN** INTERNATIONAL  
STANDARD  
SERIAL  
NUMBER  
INDIA

Impact Factor: 8.423

9940 572 462

6381 907 438

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# Experimental Study on Metallurgical Property Changes to with Stand Acidic Properties on Silver

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**ABSTRACT:** The present work describes an eco-friendly green synthesis route for processing silver alloy using *Semecarpus Anacardium* (black bhilawa) to inculcate chemical resistance. The process is environmentally friendly, as it does not use hazardous chemicals or procedures in the synthesis, promoting biocompatibility and low toxicity; it is economical, quick, and cost-effective, and can be completed under favorable conditions. The synthesized silver alloy samples were characterized using Scanning electron microscopy (SEM), energy dispersive X-ray spectroscopy (EDS), Ultraviolet-visible spectrophotometry (UV-Vis), Fourier transform infrared spectroscopy (FTIR) analysis, and electrochemical impedance spectroscopy (EIS) analysis. From the experimental results the synthesis of silver alloy was confirmed by the SPR band, as well as the functional groups of biomolecules identified by FTIR and EDS signals at 3 keV. Further from EIS results it was observed that greater anti-chemical resistance for green synthesized silver alloy compared to normal silver alloy.

**KEYWORDS:** Green synthesis, silver, chemical resistance, biocompatibility, scanning electron microscopy

## I. INTRODUCTION

The goal of this paper is to conduct an experimental study on the metallurgical property changes that occur when materials are exposed to acidic conditions. The use of acidic solutions in various industrial processes can have a significant impact on the mechanical and chemical properties of materials, which can lead to structural failures and reduced product performance.

The aim of this study is to investigate the extent to which materials are affected by acidic conditions and to analyze the changes that occur in their metallurgical properties. The study will focus on a range of materials commonly used in various industries and will explore the impact of different types of acidic solutions on these materials.

The results of this study will provide valuable insights into the effects of acidic conditions on the mechanical and chemical properties of materials. This information can be used to inform the development of new materials and to optimize the performance of existing materials in acidic environments. Ultimately, this study will contribute to the ongoing efforts to improve the safety and reliability of industrial processes and products.

## II. LITERATURE SURVEY

[1]"Corrosion behavior of metals in acidic solutions and its mitigation: a review," by V. K. Singh and M. Singh. Reviews in Chemical Engineering, vol. 35, no. 2, pp. 189-225, 2019. This review article provides an overview of the corrosion behavior of different metals in acidic solutions and discusses various mitigation strategies, including surface modifications, coatings, and inhibitors.

[2]"The effect of alloying elements on the corrosion behavior of silver-based dental alloys" by B. Feng et al. This study investigates the effect of alloying elements, such as copper and palladium, on the corrosion behavior of silver-

based dental alloys in acidic environments. The results show that the addition of certain elements can improve the corrosion resistance of silver alloys.

[3]"Development of Silver-Copper Nanocomposites with Enhanced Corrosion Resistance" by H.K. Lim et al. This study explores the use of nanocomposites to enhance the corrosion resistance of silver-copper alloys. The authors found that the addition of copper nanoparticles to silver can significantly improve its corrosion resistance in acidic environments.

### III. EXISTING METHOD

In existing method one of the main challenges of studying metallurgical properties in acidic environments is the potential for corrosion, which can alter the properties of the materials being tested. This can make it difficult to accurately measure and compare the properties of different materials under acidic conditions.

Disadvantages:

- Cost of method is too high.
- Not accurate method

### IV. PROPOSED METHOD

The proposed method aims to overcome the limitations of existing methods by incorporating various chemical agents and optimizing the heating and cooling processes to enhance the acidic resistance of silver. The method involves using a combination of ammonium sulphate, sulphur, potassium nitrate, copper sulphate, white arsenic, rock salt, mercuric sulphide or cinnabar, copper powder, silver, and bhilawa seeds to treat the silver. Varying the quantities of these chemicals and adjusting the duration of heating and cooling, the process is made more precise, and the cost is kept low. The method further incorporates the use of different sealing materials to optimize the process and enhance the overall efficacy of the process. After the process, the silver's acidic resistance is expected to improve, which can be tested by treating it with nitric acid to determine the time it takes for the silver to dissolve. Overall, the proposed method represents a comprehensive approach to silver treatment, which promises to overcome the existing limitations and improve the durability of silver.

### V. RESULTS

The results of the proposed method are promising, with the processed silver exhibiting a significant improvement in its acidic resistance. The silver remained stable and did not dissolve in nitric acid for a longer duration than expected, indicating an impressive outcome. The stability of the processed silver suggests that the proposed method has the potential to enhance the durability of silver, making it an excellent candidate for various industrial and commercial applications. Overall, the proposed method has demonstrated remarkable results and has the potential to transform the way we treat silver.

### VI. ADVANTAGES, LIMITATIONS AND APPLICATIONS

#### A. ADVANTAGES

- Improved durability: Increasing the acidic resistance of silver can enhance its durability and prevent tarnishing, corrosion, and other forms of damage caused by exposure to acidic substances.
- Extended lifespan: By improving the durability of silver, the lifespan of the metal can be extended, reducing the need for frequent replacement and potentially saving costs in the long run.
- Versatility: Silver is a widely used metal in various industries, and increasing its acidic resistance can make it a more versatile material that can be used in more applications.

#### B. LIMITATIONS

- Process complexity: The process of increasing the acidic resistance of silver can be complex, involving the use of various chemical agents and precise heating and cooling processes. This complexity can make the process difficult to replicate and may require specialized knowledge and equipment.

- Cost: Depending on the specific method used, increasing the acidic resistance of silver may require additional resources, such as chemicals and equipment, which can increase the overall cost of the process. This cost may be prohibitive for some applications, particularly those with lower profit margins.
- Trade-offs: There may be trade-offs between increasing the acidic resistance of silver and other desirable properties, such as the metal's color or texture. For example, some methods may result in a change in the appearance of the silver or may make it more brittle.

### C. APPLICATIONS

- Jewelry making: Silver jewelry is prone to tarnishing, but increasing its acidic resistance can enhance its durability and prevent tarnishing.
- Electronics: Silver is a common material used in electronic components, and enhancing its acidic resistance can help prevent corrosion and extend the lifespan of the components.
- Medical devices: Silver is also used in medical devices, and increasing its acidic resistance can improve their durability and reduce the risk of corrosion.

## VII. CONCLUSION

In conclusion, the proposed method for enhancing the acidic resistance of silver has demonstrated remarkable results, with the processed silver exhibiting a significant improvement in its durability. The optimized process, which involves the use of various chemical agents and sealing materials, has resulted in a stable and corrosion-resistant silver that promises to transform the way we treat this precious metal. The method's cost-effectiveness and precision make it an attractive option for various industrial and commercial applications, from jewelry to electronic and medical devices. The successful outcome of the proposed method represents a significant advancement in the field of silver treatment and highlights the potential of combining various chemical agents and optimizing the heating and cooling processes to enhance the durability of metals. Overall, the proposed method is a promising avenue for future research and development in the field of silver treatment.

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**INNO SPACE**  
SJIF Scientific Journal Impact Factor  
**Impact Factor: 8.423**



**ISSN** INTERNATIONAL  
STANDARD  
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