

INNOVATIVE DESIGN APPROACHES: EXPLORING THE POTENTIAL OF LATEX IN CREATIVE MATERIAL PRODUCTION

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ABSTRACT

This research delves into the potential of latex as a creative material for product design, with a specific focus on Thailand, the world's leading producer of natural rubber. Despite its unique properties such as flexibility, durability, and water resistance, the use of latex in Thailand has traditionally been limited to industrial goods. This research aims to bridge this gap by investigating the potential of latex in creative product design.

The research is structured into two phases: a comprehensive literature review and an experimental investigation. The literature review examines the current state of knowledge regarding latex, its properties, and its applications. The experimental investigation involves the practical application of this knowledge in the design and creation of creative materials using latex.

The research results underscore the versatility of latex as a creative material. The first experiment demonstrated the ease of molding natural rubber and its ability to retain shape quickly. The second experiment revealed some challenges when attempting to create a softer material through foaming.

However, the third experiment, which explored the shaping of natural rubber in a high-dimensional form, yielded the most promising results. It demonstrated that natural rubber, after shaping, could retain its shape effectively and capture the details in the mold. This experiment has significant implications for product design, as it suggests that natural rubber can be used to create intricate, high-dimensional designs without the need for additional structural mixtures.

In conclusion, this research underscores the significant potential of latex as a creative material and the need for careful consideration of the material's properties and the manufacturing process in the design of creative products. The findings, particularly those from the third experiment, provide a valuable foundation for further exploration and development in the field of creative product design using latex, especially in Thailand, the world's leading producer of natural rubber.

Keywords: Innovative Design Approaches, Latex, Creative Material

INTRODUCTION

The quest for sustainable and innovative materials has become a focal point in the field of product design, driven by the growing awareness of environmental issues and the need for sustainable development. Among the plethora of natural resources available, latex, a milky fluid derived primarily from the rubber tree (*Hevea brasiliensis*), holds significant potential due to its unique properties such as flexibility, durability, and water resistance.

Thailand, as the world's leading producer of natural rubber, possesses an abundant supply of latex, making it a prime candidate for exploring the material's potential in creative product design. However, the utilization of latex in Thailand has traditionally been confined to the

production of tires, gloves, and other industrial goods. The potential of latex as a material for creative design remains largely untapped and under-researched.

This paper, titled "Innovative Design Approaches: Exploring the Potential of Latex in Creative Material Production," aims to bridge this gap. It seeks to delve into the unexplored realm of latex, investigating its potential and versatility as a material for creative product design. By doing so, it hopes to contribute to the body of knowledge in the field of sustainable design and offer new avenues for the utilization of latex, thereby adding value to this abundant resource in Thailand.

Through a comprehensive study of latex properties, an exploration of innovative design strategies, and the development of prototype products, this research will demonstrate the untapped potential of latex as a creative material. In doing so, it will not only contribute to the academic discourse on sustainable materials but also provide practical insights for designers, manufacturers, and stakeholders in the rubber industry.

Research Objectives

To Study the Properties and Potential of Latex as a Creative Material.

Scope of Research

This research aims to explore the properties and potential of latex as a creative material, with a particular focus on its application within the context of Thailand, the world's leading producer of natural rubber. The scope of this research is twofold: a comprehensive literature review and an experimental investigation.

1. Literature Review: The research will begin with an exhaustive literature review to understand the current state of knowledge regarding latex, its properties, and its applications. This will involve a thorough examination of academic articles, industry reports, and case studies related to latex and its use in various industries. The review will also encompass a detailed analysis of the physical and chemical properties of latex, such as its flexibility, durability, and water resistance, and how these properties can be leveraged in the design of creative products.

2. Experimental Investigation: Following the literature review, the research will proceed to an experimental phase. This will involve the practical application of the knowledge gained from the literature review in the design and creation of creative materials using latex. The aim is to experiment with various design approaches and techniques, evaluate the performance of these designs, and thereby demonstrate the feasibility and potential of using latex in creative product design. This hands-on exploration will provide tangible examples of latex application and offer insights into its practical advantages and potential challenges.

METHODOLOGY

This research involves experimental research aimed at an in-depth study of the properties and potential of latex as a creative material, particularly in the context of lifestyle product design, utilizing the framework of flexibility, durability, and water resistance.

The research is divided into two phases:

Phase 1: Studying the properties of natural rubber that can be applied in the design of creative products.

- Targeted population and sample groups: Shaping processes from natural rubber latex.
- Recording experimental results of material fabrication from natural rubber.

Phase 2: Experimental fabrication of materials from natural rubber, using the framework of Hardness Tensile Strength Elongation at Break.

RESULTS

Phase 1: Study of the Properties of Natural Rubber for Creative Product Design

The research focused on studying the properties of natural rubber that can be applied in the design of creative products. Natural rubber is characterized by several distinctive properties, such as flexibility, tensile strength, hardness, softness, tear resistance, elongation at break, tear strength, and heat resistance. All these properties make natural rubber a unique material for creative product design.

Therefore, in designing materials for creative products, it is essential to understand the properties of the materials used. The selection of raw rubber, chemical additives, and production techniques must be appropriate for the designed product. This involves a careful study of the properties of the rubber and the selection of suitable additives and production techniques to match the requirements of the product design.

Phase 2 : Experimental Shaping of Materials from Natural Rubber

Table 1: Experiment 1 - Shaping of Natural Rubber into a Sheet Form


| Experiment | Chemical Materials Used in the Experiment | Prototypes |
|--|--|--|
| Experimental Fabrication of Rubber Latex into Sheet Format | The chemical materials utilized in the experiment are as follows: 1 Raw Natural Latex (Nature Latex, NR) with a concentration of 60% 2 Sulphur (S) 3 Wingstay (L) 4 Zinc Oxide (ZnO) 5 SFF (an abbreviation referring to a specific chemical compound or substance) 6 Colorant (Color) |  |

Table 2: Results of Conversion and Formed Characteristics

| Experiment | Results of Conversion | Formed Characteristics (100°C) |
|--|---|---|
| Experimental Fabrication of Natural Rubber in Sheet Format | - Easy Moldability - Quick Set Time - Shape Retention and Good Water Dispersion | Hardness 50 + Shore A ISO 7619-1 standard Tensile Strength 6 MPa ISO 37 standard Elongation at Break 350 % ISO 37 standard |

Table 3: Experiment 2 - Foam Rubber Forming (Foaming Process)

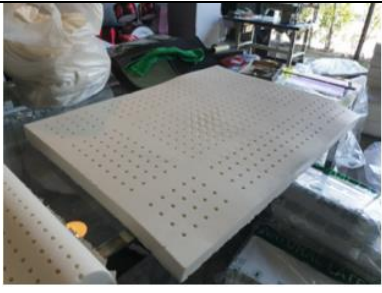
| Experiment | Chemical Materials Used in the Experiment | Prototypes |
|---------------------------------------|--|--|
| Foam Rubber Forming (Foaming Process) | <p>The chemical materials employed in the experiment are as follows:</p> <ol style="list-style-type: none"> 1 Raw Natural Latex (Nature Latex, NR) with a concentration of 60% 2 Potassium Laureate 3 Sulphur (S) 4 Wingstay (L) 5 Zinc Oxide (ZnO) 6 SFF (specific substance or compound) Colorant (Color) |  |

Table 4: Experiment 2 - Foam Rubber Forming (Foaming Process) Results

| Experiment | Results of Conversion | Formed Characteristics (100°C) |
|---------------------------------------|---|---|
| Foam Rubber Forming (Foaming Process) | <p>Advantages:</p> <ol style="list-style-type: none"> 1 Easy Formability 2 Rapid Set Time 3 Shape Retention <p>Disadvantage:</p> <ol style="list-style-type: none"> 1 Inability to Fully Utilize Rubber Latex | <p>Advantages:</p> <ol style="list-style-type: none"> 1 High Flexibility and Softness 2 Customizable Forming 3 Natural Antibacterial Properties <p>Hardness 11.72 + 3.13 + Shore A ISO 7619-1 standard</p> |

Table 5: Experiment 3 - Dimensional Rubber Forming with High Embossing


| Experiment | Chemical Materials Used in the Experiment | Prototypes |
|--|--|--|
| Dimensional Rubber Forming with High Embossing | <p>The chemical materials employed in the experiment are as follows:</p> <ol style="list-style-type: none"> 1 Raw Natural Latex (Nature Latex, NR) with a concentration of 60% 2 Potassium Laureate 3 Sulphur (S) 4 Wingstay (L) 5 Zinc Oxide (ZnO) 6 SFF (specific substance or compound) Colorant (Color) |  |

Table 6: Experiment 3 - Dimensional Rubber Forming with High Embossing Results

| Experiment | Results of Conversion | Formed Characteristics (100°C) |
|--|--|---|
| Dimensional Rubber Forming with High Embossing | Advantages: 1 Easy Moldability and Good Mold Distribution 2 Quick Set Time 3 Dimensional Stability | Hardness 50 + Shore A ISO 7619-1 standard Tensile Strength 6 MPa ISO 37 standard Elongation at Break 350 % ISO 37 standard |

Summary of Experimental Results

From the first experiment, it was found that when natural rubber latex was mixed with chemicals in the right proportions and then poured into a prepared mold, the latex spread well in the mold and quickly retained its shape. After baking, the rubber was able to recover well. The hardness test of the workpiece yielded a value of 50 + Shore A.

This differed from the second experiment, where natural rubber was mixed with chemicals and whipped to create foam, aiming for a softer property. The resulting hardness value was 17.72 + Shore A. When poured into the mold, it could not retain its shape, and the flow of the latex was not good, resulting in a porous surface on the final product. This led to easy tearing when compared to the first experiment.

Therefore, the third experiment was an extension of the first experiment, studying the shaping of natural rubber materials in a high-dimensional form. The aim was to see if the natural rubber, after shaping, could retain its shape without the need for other structural mixtures and could capture the details in the mold as best as possible. Therefore, the third experiment was used as a guideline for designing creative materials.

CONCLUSION AND DISCUSSION

The research conducted has provided valuable insights into the potential of latex as a creative material, particularly within the context of lifestyle product design. The experiments conducted have demonstrated the versatility of latex, showcasing its unique properties such as flexibility, durability, and water resistance.

The first experiment highlighted the ease of molding natural rubber and its ability to retain shape quickly, yielding a hardness value of 50 + Shore A. This experiment underscored the potential of latex as a robust and flexible material for creative product design.

The second experiment, however, revealed some challenges. The attempt to create a softer material through foaming resulted in a product that could not retain its shape well and had a porous surface, leading to easy tearing. This experiment underscored the need for careful consideration of the material's properties and the manufacturing process in the design of creative products.

The third experiment, building on the findings of the first, explored the shaping of natural rubber in a high-dimensional form. The results demonstrated that natural rubber, after shaping, could retain its shape without the need for other structural mixtures and could capture the details in the mold effectively.

In conclusion, this research has demonstrated the significant potential of latex as a creative material. However, it also underscores the need for careful consideration of the material's properties and the manufacturing process in the design of creative products. The findings of this research provide a valuable foundation for further exploration and development in the field of creative product design using latex, particularly in Thailand, the world's leading producer of natural rubber.

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