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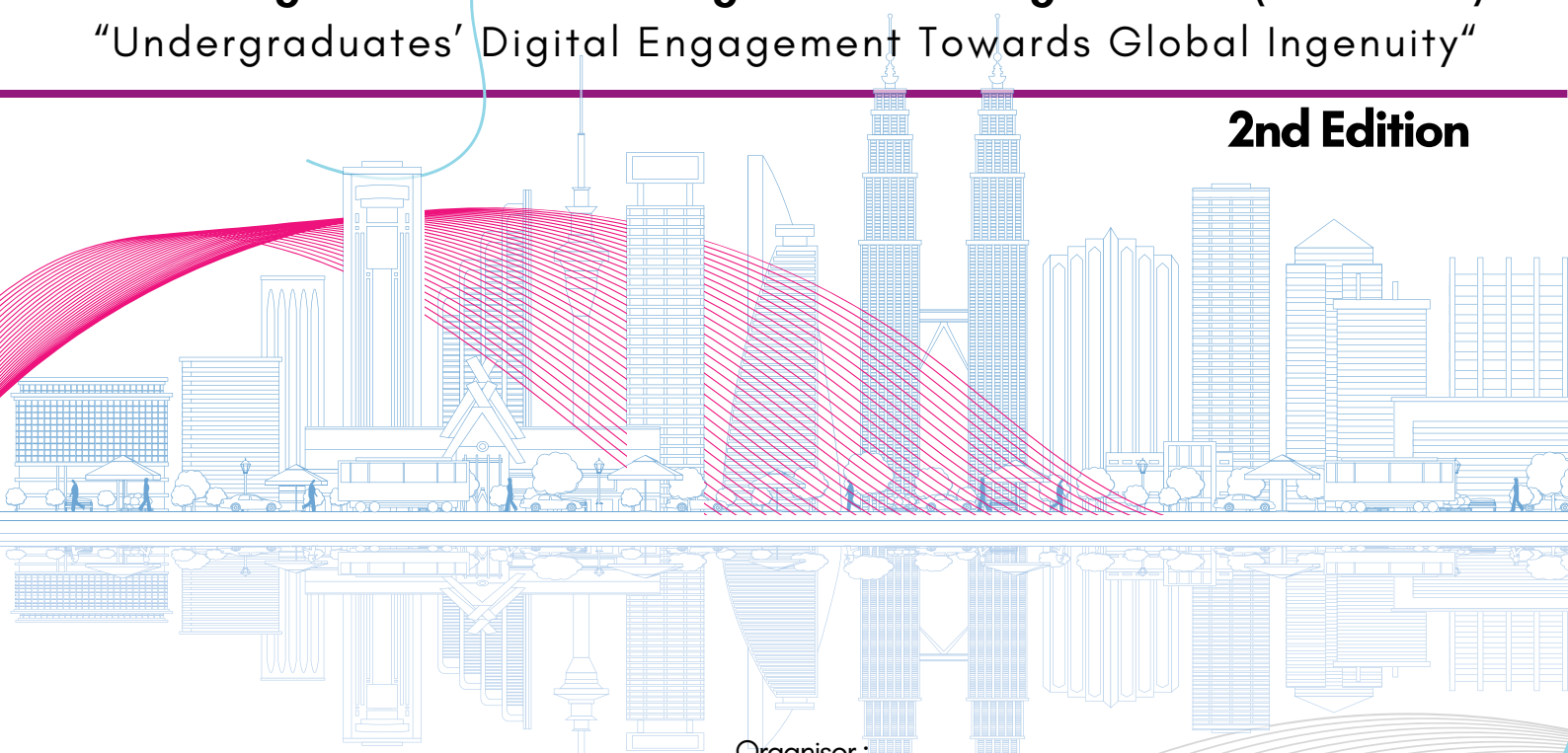
Proceeding for International Undergraduates Get Together 2024 (IUGeT 2024)

"Undergraduates' Digital Engagement Towards Global Ingenuity"

2nd Edition



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Co-organiser :

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USING EGGSHELLS AS A SUSTAINABLE SUBSTITUTE FOR FLOOR TILE MATERIAL

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Abstract
This paper explores the potential of using eggshells as a substitute for floor tile material, aligning with the principles of sustainable design and waste reduction. The concept involves combining eggshells with a binding agent or resin to create a composite material with the necessary structural integrity. The feasibility of this approach is considered from various aspects, including material properties, processing, composite material development, aesthetics and design, environmental impact, and potential benefits. The study highlights the challenges associated with collecting and processing large quantities of eggshells, ensuring the material performance meets required standards, and gaining market acceptance. Implementation steps are proposed, including research and development, prototype creation, testing and certification, scaling up, and market introduction. The study concludes that while the concept is not yet mainstream, it holds potential as an innovative and sustainable solution that can contribute to more sustainable building practices and waste reduction efforts.

Keywords: *sustainable design, waste reduction, eggshells, floor tile material, composite material development, environmental impact.*

1. INTRODUCTION

The use of eggshells as a substitute for floor tile material is an intriguing idea that aligns with the principles of sustainable design and waste reduction. Eggshells are a common byproduct of the food industry, often considered waste. By repurposing eggshells, this concept can contribute to waste reduction and recycling efforts.

1.1 Feasibility and Consideration

The feasibility of using eggshells as a substitute for floor tile material is dependent on several factors. Material properties, processing techniques, and composite material development are all critical considerations.

i. **Material Properties:** Eggshells are primarily composed of calcium carbonate, which is relatively brittle. For floor tiles, the material needs to be strong and durable enough to withstand foot traffic and wear. A binding agent or resin would need to be used to create a composite material with the necessary structural integrity.

ii. **Processing:** Collecting a sufficient quantity of eggshells and cleaning them to remove organic residues is essential to prevent odour and bacterial growth. Eggshells would need to be ground into a fine powder or small granules to be effectively mixed with a binding agent.

iii. **Composite Material Development:** A sustainable resin or polymer could be used to bind the ground eggshells. This composite would need to be tested for hardness, durability, and flexibility.

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iv. **Aesthetic and Design:** The final product's appearance would depend on the processing of the eggshells and the type of binding agent used. It could potentially offer a unique, natural aesthetic. The surface texture and finish would need to be designed to ensure it is non-slip and aesthetically pleasing.
v. **Environmental Impact:** Utilising eggshells could reduce landfill burden and promote recycling. However, the environmental impact of the binding agent and the overall lifecycle of the tiles should also be considered.

1.2 Potential Benefits

Using eggshells as a substitute for floor tile material offers several potential benefits:

i. **Waste Reduction:** Using eggshells repurposes a waste product, contributing to waste reduction and recycling efforts.
ii. **Sustainability:** If combined with eco-friendly binding agents, this could result in a more sustainable flooring option compared to conventional materials.
iii. **Innovation:** This approach can stimulate innovation in sustainable building materials and promote the circular economy.

1.3 Challenges

While the concept holds potential, there are several challenges associated with using eggshells as a substitute for floor tile material:

i. Scale: Collecting and processing large quantities of eggshells could be logistically challenging.
ii. Material Performance: Ensuring the final composite material meets the required standards for flooring applications.
iii. Market Acceptance: Convincing the market to adopt an unconventional material for flooring.

1.4 Implementation Steps

To overcome these challenges, implementation steps are proposed:

i. **Research and Development:** Conduct initial feasibility studies to assess the mechanical properties of the eggshell-based composite. Experiment with different binding agents and processing techniques.
ii. **Prototype Creation:** Develop small-scale prototypes to test durability, strength, and aesthetic appeal.
iii. **Testing and Certification:** Perform rigorous testing to meet building material standards and certifications.
iv. **Scaling Up:** Develop a scalable process for collecting, cleaning, and processing eggshells. Establish partnerships with egg producers or food industries for a consistent supply of eggshells.
v. **Market Introduction:** Launch pilot projects and gather feedback. Educate potential customers about the benefits and performance of the new material.

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Figure 1. Eggshells.

Figure 2. Tiles using eggshells.

Figure 3. Tiles using eggshells.

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2. CONCLUSION

While the concept of using eggshells as a substitute for floor tile material is not yet mainstream, it holds potential as an innovative and sustainable solution. Further research and development are needed to address the technical and logistical challenges, but if successful, it could contribute to more sustainable building practices and waste reduction efforts.

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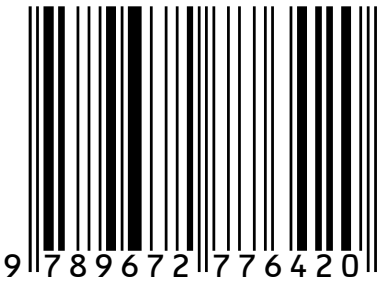

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