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COVER LETTER

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[*July 21st, 2024*]

Dear Editor,
I wish to submit an original research article entitled "[Investigation on mechanical properties and microstructural characteristic of rice hush ash based geopolymer mortar as patch repair] for consideration by SINERGI.

We confirm that this work is original and has not been published elsewhere, nor is it currently under consideration for publication elsewhere. We promise not to withdraw this article after it has been processed by the Editorial Team. If there is a withdrawal, we are willing to pay a penalty of USD 150 (IDR 2000K) to the SINERGI Editorial Team.

In this paper, I/we report on / show that:

Field	:	Civil Engineering
Topic	:	Concrete and Material Engineering
Brief Background	:	Geopolymers provide a significant benefit in mitigating the release of carbon dioxide during construction. Research has shown that geopolymers have the potential to decrease carbon dioxide emissions by as much as 80% when compared to conventional Portland cement. This reduction is accomplished by using industrial and agricultural waste materials, which not only redirects these wastes from landfills but also reduces the dependence on energy-intensive cement manufacturing processes. Geopolymers provide a sustainable answer to the environmental difficulties presented by the building sector. Indonesia's extensive agriculture industry offers a unique chance to create and use environmentally friendly building materials. In 2020, the Central Bureau of Statistics reported that the total land area of Indonesia is 191.09 million hectares, out of which about 9.81 million hectares are specifically used for agricultural. Rice is considered one of the most important agricultural commodities. Rice production produces significant

		quantities of trash, such as rice husk, which is often unused. The country's daily rice production averages 350 tons, which yields 250 tons of rice, 50 tons of bran, and 50 tons of rice husk. Rice husk ash (RHA) is a byproduct of burning rice husk and has a high concentration of silica, ranging from 87% to 97%. The high silica concentration of RHA makes it very suitable for usage as a pozzolan. Pozzolans are substances that, when combined with lime, have cementitious characteristics. In order to be classified as a pozzolan, a material must have a collective amount of silicon dioxide (SiO2), iron oxide (Fe2O3), and aluminum oxide (Al2O3) that is more than 70%. Due to its composition, RHA fulfills these requirements and may be efficiently used in geopolymer compositions.
Research Problem	:	Currently, there has been no academic study undertaken to examine the use of rice husk ash as a pozzolan in geopolymer binders, particularly for building applications. Despite the existence of many studies that have proven the efficiency of using waste materials to produce eco-friendly building components and their related environmental advantages, there is a noticeable lack of empirical data regarding the mechanical characteristics of rice husk ash when used as a substitute for conventional cement in geopolymer formulations. This study seeks to fill this void by providing comprehensive analysis of the physical characteristics of geopolymers made from rice husk ash, specially to find the patch repair mortar formulation. This presents a unique method for reducing the ecological impact of the building sector.
Overview of Method	:	This study explores using rice husk ash and alkali activators (NaOH/Na2SiO3) with different activator percentages (40%, 45%, and 50%) to evaluate their mechanical properties and potential applications as patch repair materials. The research involved formulating an optimal mix design through trial and error in a laboratory setting, followed by curing at 70°C and testing at room temperature. XRF and SEM-EXD analyses were performed to determine the chemical composition and microstructure of the specimens. The activators, NaOH and Na2SiO3, were used in a 1:3.5 ratio with 14M molarity and 2% superplasticizer to enhance workability.
Significant finding	:	The study highlights that rice husk ash, with a high silica content of 85.6%, plays a crucial role in the mechanical

		properties of geopolymer mortar. The mechanical tests reveal that the highest compressive strength (8.14 MPa) is achieved with 40% alkali activator, while the optimal split tensile and flexural strengths (2.50 MPa and 1.00 MPa, respectively) occur with 50% alkali activator. These strengths are linked to the high silica content and effective formation of silica-alumina polymer bonds. However, current limitations arise from incomplete hydration reactions and the lower reactivity of rice husk ash, which result in weaker structural bonds. Factors such as the burning technique and the type of rice used impact the quality of the mortar. Optimizing these processes can enhance the performance of rice husk ash-based geopolymer mortar. While it may not yet match the strength of traditional mortar, it presents a sustainable and eco-friendly alternative. This material is particularly suitable for applications where lower-strength mortar is acceptable, such as repairing structures and large-scale casting in extreme weather conditions, thereby making effective use of available materials while meeting the structural needs of low-demand projects.

We have no conflicts of interest to disclose.

Thank you for your consideration of this manuscript.

Sincerely,
[*Pinta Astuti*]

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AUTHORSHIP STATEMENT

I wish to submit an original research article entitled "[Investigation on mechanical properties and microstructural characteristic of rice hush ash based geopolymer mortar as patch repair]" for consideration by SINERGI.

All persons who meet authorship criteria are listed as authors, and all authors certify that they have participated sufficiently in work to take public responsibility for the content, including participation in the concept, design, analysis, writing, or revision of the manuscript.

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POTENTIAL REVIEWERS

Please submit 3 (three) potential reviewers (*that have not listed in SINERGI*) to speed up the review process that competent for the topic and has a good reputation in that area.

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