



Laporan Akhir Projek Penyelidikan Jangka Pendek

**Development of Photoluminescence
Glass Derived from Rice Husk Ash**

**By
Dr. Yeoh Fei Yee
Ms. Lee Ting
Prof. Ahmad Fauzi Mohd Noor**

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UNIVERSITI SAINS MALAYSIA

Final Report

Of

**DEVELOPMENT OF
PHOTOLUMINESCENCE GLASS**

**DERIVED FROM
RICE HUSK ASH**

Funded by

**Nippon Sheet Glass Foundation for
Materials Science and Engineering**

Prepared by

Yeoh Fei Yee and Lee Ting

School of Materials and Mineral Resources Engineering

University Sains Malaysia

Laporan Kemajuan dari Segi Kerja-kerja yang Telah Dijalankan:

Final Report for All Conducted Work

(Sila sertakan Laporan Kemajuan yang berkaitan dan juga penerbitan yang telah dihasilkan)

(Kindly attach progress reports that are relevant as well as resulting publications)

DEVELOPMENT OF PHOTOLUMINESCENCE GLASS DERIVED FROM RICE HUSK

TECHNICAL REPORT:

In this study, rice husk ash (RHA) was used as a substitute source for commercial silica sand in glass making. Silica content in RHA derived from rice husk powder by combustion at 1000 °C for 2 hours was found as high as 96 % which was comparable to that of commercial silica. The glass made from RHA was named as rice husk glass (RHG). Density and knoop hardness tests were carried out on the RHG. The samples gave good density and hardness values of 2.619 g/cm³ and 374.2 HK respectively, as good as commercial glass. In order to value add the RHG into a more valuable product, four colour of photoluminescence pigments i.e. green, blue, white and orange were added into RHG, making it into a photoluminescence t RHG or PL-RHG . Up to date, we have successfully produced photoluminescence rice husk glasses which able to charmingly glow in dark with green and blue colours after a light excitation (Figure 1).



Figure 1: Samples of colourful PL rice husk glass, rice husk glass and silica glass in dark environment after light excitement

For further investigation, green PL-RHG was chosen among others. The photoluminescence property of the PL-RHG was found to withstand high temperature (~ 1000 °C) with good photoluminescence properties. Two different processes were developed to add the PL pigments into RHG namely layering and mixing process. For layering process, the PL rice husk glass was produced by spreading the PL pigment in between two layers of RH glass mimicking a sandwich structure. On the other hand in a mixing process, the PL pigment was mixed directly into molten glass. From the study, PL-RHG produced by layering method is more preferable. The PL pigment in the sandwich glass structure was less decomposed and performed well with better glowing effect. A photoluminescence instrument was used to measure the intensity of the photoluminescent properties for the PL glass. Longer of exposure to strong light gave the PL-RHG a higher brightness and intensity of light emission.

FINANCIAL REPORT:

A total of USD 6,500 or RM 21,984.15 was awarded by Nippon Sheet Glass Foundation. After deduction of 2.5% admin service charge or RM 549.60, the balance RM 21434.55 was utilised as scheduled. The fund was placed in the account namely “Development of Photoluminescent Glass Derived from Rice Husk Ash” with grant number 304/PBAHAN/6050186/N100. At the end of project, the fund was utilised efficiently with a balance of RM 29.08 left as shown in the attached financial statement.

RESEACH OUTPUTS/ ACHIEVEMENT:

Postgraduate Student:

A master student was produced with this research fund.

Master Student: Lee Ting (P-GM0029)

Publications

A thesis was produced in this study. Preparation of a research paper is in progress and will be submitted to an international journal upon completed.

Thesis: Development of Photoluminescence Glass Derived from Rice Husk Ash

International Award

A silver invention award was received during the participation of the product developed in this project in 22nd International Invention, Innovation and Technology Exhibition ITEX 2011 at Kuala Lumpur Convention Center (KLCC). Pictures and details are shown as followed.

1) Title: Photoluminescent Rice Husk Glass

Silver award in 22nd International Invention, Innovation and Technology Exhibition ITEX 2011

Ministry of Science, Technology & Innovation

Kuala Lumpur Convention Center (KLCC), 18-22 May 2011)

During the exhibition, a lot of encouraging attention and response were received from the visitors who paid attention to the PL-RHG product. Presently, a patent application and a journal paper are under preparation. It is expected to be submitted within 6 months. Some potential applications have been identified to make the PL-RHG into more value-added products, building decorations, highway markings, exit signs, accessories and glassware.



Figure 2: Silver Award was won in 22nd International Invention, Innovation and Technology Exhibition ITEX 2011. (From left: Prof. Radzali Othman, Mr. Cheah Wee Keat, Dr. Yeoh Fei Yee and Ms. Lee Ting)

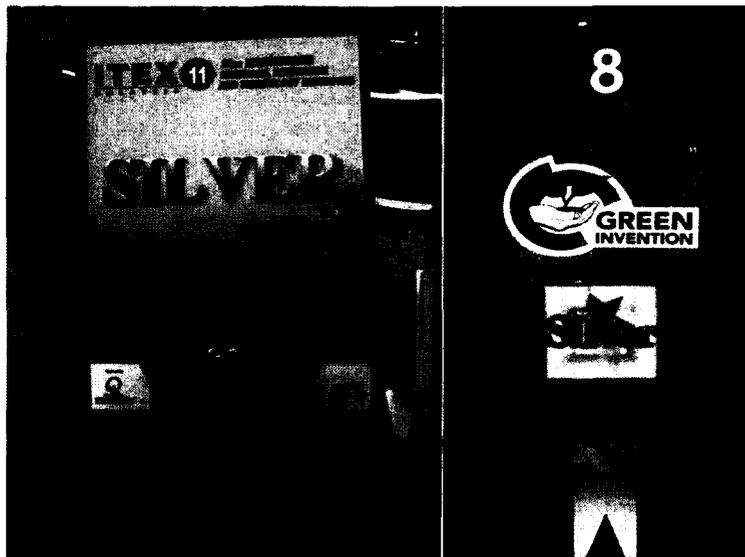


Figure 3: Silver award certificate and ITEX medal were received for project “Photoluminescent Rice Husk Glass”.

ACKNOWLEDGEMENT

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