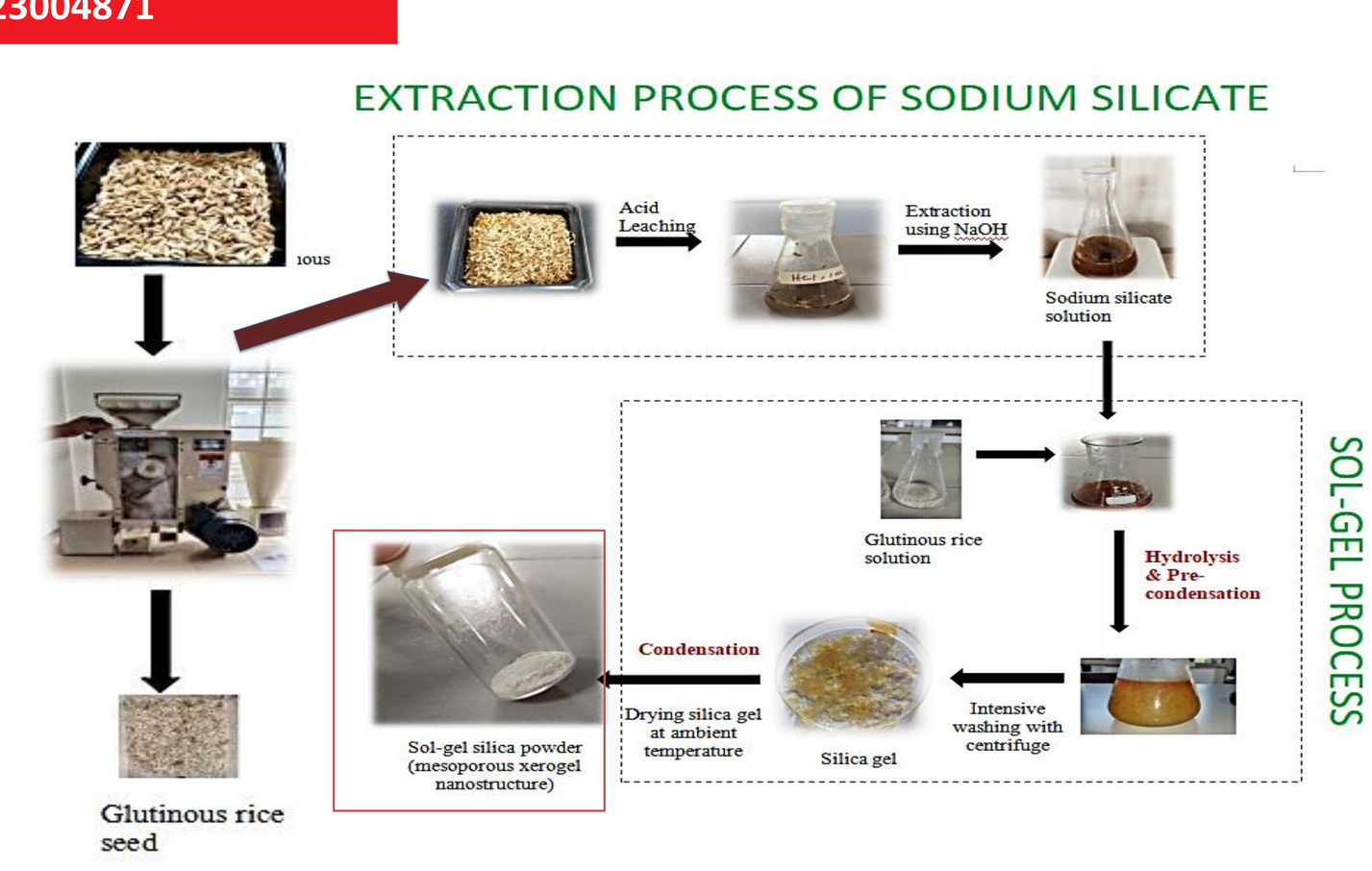
# Biogenic Nanosilica Xerogel From Low Cost Renewable Resources Glutinous Rice Husk

**IPR NO. PI2023004871**

GRH-silica xerogel$^{GR}$

| | Specific surface area ($m^2/g$) | Average pore diameter (nm) |
|---|---|---|
| Prior technology | > 250 | > 5 |
| GRH-silica xerogel$^{GR}$ | 376.54 | 4.14 |




## BRIEF TECHNOLOGY

The present invention relates to the development of mesoporous silica xerogel nanostructure by using low-cost **renewable resources of glutinous rice husk** with glutinous rice as a green bio-additive named GRH-silica xerogel$^{GR}$ and their method of preparation by the sol-gel method under ambient pressure and temperature.

## CURRENT ISSUES

- The current method for **silica production involves the use of hazardous chemicals** like chlorine dioxide, chlorate, chlorite, and hypochlorites, which can lead to severe side effects, including vomiting, diarrhea, liver failure, and even fatalities.
- **Costly** and non-environmental friendly
- Consumes a **significant amount of energy**

## INVENTIVENESS & NOVELTY

- GRH-silica xerogel$^{GR}$ uses low-cost, ambient processing temperature, an easy synthesis route, low-energy processing, and a mild method of the sol-gel process.
- Glutinous rice that rich with protein as compared to white rice as well as amylopectine and amylose was used as a new green additive to improve the properties of silica.
- The synthesis occurs at ambient temperatures, reducing energy consumption and environmental impact as well as production cost.
- GRH-silica xerogel$^{GR}$ has an amorphous structure and larger specific BET surface area of 376.54 $m^2$ $g^{-1}$, compared to silica xerogel without additive.
- The process is low-toxicity, non-carcinogenic, and biocompatible, ensuring safety in various applications.
- Leveraging nanotechnology, it opens doors to a wide range of applications and mass production.

## USEFULNESS & APPLICATION

- Suitable as a support or carrier for enzyme immobilization, crop fertilizers, and food packaging.
- Effective as an adsorbent, catalyst, and crop fertilizer.
- Their biocompatibility and non-toxic nature make them well-suited for various biomedical and bioprocessing applications, including drug delivery, wound healing and dressings, tissue scaffolding, and biosensing applications.

## IMPACT OF THE PRODUCT

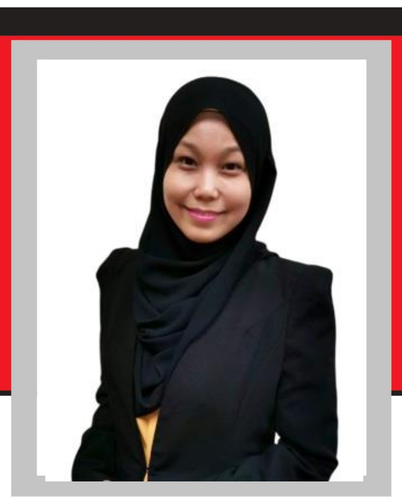
- Addressing the environmental challenge of glutinous rice husk disposal
- It utilizes low-cost, readily available materials, making it economically sustainable.
- Eliminating the need for complex and high-pressure equipment like supercritical dryers, resulting in a significant reduction in manufacturing costs
- Creating an eco-friendly mesoporous GRH-silica xerogel nanostructure with a mild microenvironment (pH 7) compatible with biological applications
- Expanding the potential uses of glutinous rice beyond traditional food applications

## MARKET POTENTIAL

- Agricultural industry - crop fertilizer, seed treatment and for improved plant growth
- Wastewater industry
- Rubber industry
- Bioimaging/biosensing
- Coating
- Ceramic industry

**Technology Readiness Level (TRL)**

**8** - Product/System complete and qualified

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7 AFFORDABLE AND CLEAN ENERGY

12 RESPONSIBLE CONSUMPTION AND PRODUCTION