

# Bioinspired green method for mesoporous silica

## Technology invention

We have discovered a reproducible, sustainable alternative route to mesoporous silica at room temperature, neutral pH and within minutes. This overcomes the barriers of existing methods and unlocks manufacturing for mesoporous silica.

## Overview

Bioinspired silica (BIS) technology (WO/2017/037460) offers rapid synthesis and simplicity, enabling faster, greener manufacture of silica compared to current TEOS and surfactant based methods. This invention (GNRG-03) enables imprinting (semi)ordered mesoporous features into the materials with a controllable pore size.

## Market Potential

Mesoporous silicas are well known to exhibit a diverse range of physicochemical properties, enabling the materials to host chemical reactions, separations, and guest molecules. This has led to potential applications of mesoporous materials as CO<sub>2</sub> sorbents for large point sources (e.g. power plants), use as next-generation targeted drug delivery systems, and as (bio)catalyst supports enabling shape-selective or cascade reactions. However, despite these and many other areas of potential applications, commercialisation of traditional methods/ materials (e.g. MCM-41) has not been achieved to date at large scales.

## Technology Description

GNRG-03 invention uses a 2-step BIS synthesis method. The pore sizes are controlled by the process conditions. GNRG-03 technology is rapid (takes only minutes) and operates at room temperature, in water and at neutral pH.

## Advantages

- A room-temperature technique that is inherently sustainable and economical.
- It avoids all drawbacks of calcination-based techniques typically used in making materials such as MCM-41 frameworks.

- This is the first report of synthesis of mesoporous silica that does not require large energy inputs unlike traditional mesoporous silica syntheses (Low OPEX).
- GNRG-03 involves only common industrial chemicals and processes, avoiding typical practical issues.
- Potential for minimal infrastructure changes or retrofitting existing processes (Low CAPEX).
- It has the potential of large scale production in both continuous and batch processes.

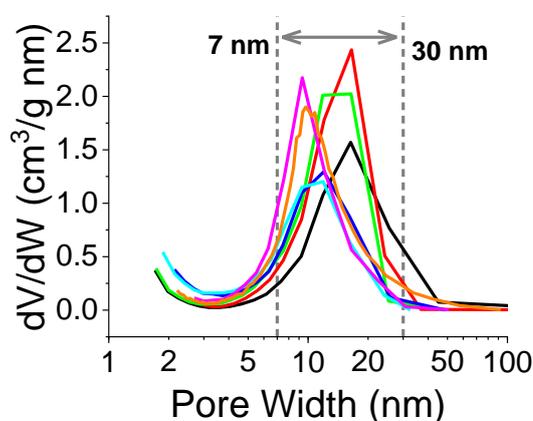


Figure 1 – Pore size distribution of mesoporous BIS can be controlled between 7-30 nm range.

## Material properties

GNRG-03 technology enables a variety of porous properties to be produced in a highly reproducible fashion. Pores between 7 and 30 nm can be easily targeted by tuning process (Figure 1).

## Technology Status

This technology currently operating at technology readiness level 2 and patent application is in preparation. Know-how is available to support the exploitation of the invention and any subsequently produced IP in collaboration with a chosen industrial partner.

## Contact

For further information or to discuss this, please contact Professor S. V. Patwardhan at [s.patwardhan@sheffield.ac.uk](mailto:s.patwardhan@sheffield.ac.uk).