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Mesoporous silica nanoparticles with ultra high porosity

Novel mesoporous silica nanoparticles with high pore volume and open pore structure, displaying high thermal stability and mechanical sturdiness

IP Status:US Patent Issued #9,943,826

Technology ID

20140012

Category

Engineering & Physical Sciences/Materials
Engineering & Physical Sciences/Nanotechnology
Life Sciences/Diagnostics & Imaging
Life Sciences/Industrial Biotech
Life Sciences/MRI & Spectroscopy
Life Sciences/Pharmaceuticals
Life Sciences/Therapeutics

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Related Technology: Nanoparticle bio-pesticide to improve crop health, germination, and overall yield

Applications

- Drug delivery
- Biosensors
- MRI/PET imaging probes
- Heterogeneous catalysis
- Adsorbent in separation process

Key Benefits & Differentiators

- **Tunable properties:** tailorable mesoporous structures and facile surface modifications make this novel nanoparticle highly versatile and suitable for a wide range of applications
- **High cargo capacity:** high pore size to particle size ratio allows for a variety of materials to be loaded into the pores in substantial quantities
- **Controlled release of materials** the nanoparticle's empty interior is surrounded by a shell of mesopores, which enables materials to be released slowly and in a controlled manner

Technology Overview

Mesoporous silica nanoparticles (MSNs) have received significant attention as a potential delivery system to transport drugs and other materials, as they can be synthesized to achieve large pore volumes while keeping the small particle size. However, currently employed methods to synthesize MNSs, and pore swelling strategies have seldom topped 2.0 cm3/g pore volumes. In addition, swollen or hollow structures can result in small micro- or mesopores on the shell portion of a particle, and in thin silica walls, all of which are prone to breakage and aggregation.

Researchers at the University of Minnesota have developed ultra-porous silica nanoparticles with high surface area (~1200 m2/g) and ultra-large void volume (>3cm3/g).These novel particles are conveniently small at less than 200 nanometers in diameter, and have controllable pore size which allows for a variety of drugs or other materials to be loaded into the particles. This MSN also features a large, empty interior for the storage of compounds surrounded by a shell of mesopores that can release materials in a controlled manner. Ultra-porous MSN is a versatile platform that can be made appropriate for applications ranging from environmental remediation to biomedical sensing, retaining all the stability and surface-modification potential available in more traditional mesoporous silica nanomaterials synthesis.

Phase of Development

TRL: 3-5
Particles have been synthesized and characterized.

Desired Partnerships

This technology is now available for:

- License
- Sponsored research
- Co-development

Please contact our office to share your business' needs and learn more.

Researchers

- **Christy Haynes, PhD** Professor, Department of Chemistry

References

1. Egger, S.M., Hurley, K.R., Datt, A., Swindlehurst, G. and Haynes, C.L(2015) , Ultraporous Mesostructured Silica Nanoparticles, https://doi.org/10.1021/cm504448u