International Advanced Research Centre for Powder Metallurgy & New Materials (ARCI)

Balapur P.O., Hyderabad – 500005, Telangana, India

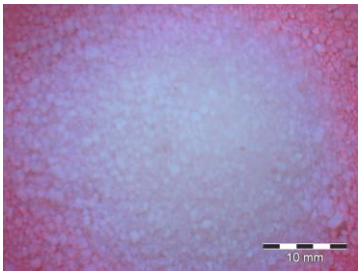
Silica Aerogel Granules for Thermal Insulation Application

Overview

Silica aerogels are world's best thermal insulation materials. These are nanoporous material with ultra low density. Literally aerogels mean air filled gels. Monolithic pure silica aerogels are highly fragile in nature and this was the major decelerating factor for its commercial use. This led to make new usable forms of silica aerogel namely flexible sheets made up by fibre reinforcement and granular aerogel. ARCI has embarked on world class product of silica aerogel flexible sheets and it is under commercialization. Granular silica aerogels are also developed at ARCI using a novel method for which the patent has been applied. Granular silica aerogel can be very conveniently used in many ways such as by filling them around the object to be insulated or these can be sandwiched between metal, glass, wood plates, fabric etc. and also can be used as an additive to paints, cement, bricks, insulation panels etc.

Key Features

- Granule size : ~ 1 mm (Tuneable)
- Packing density: 0.07 g/cc
- Thermal stability : - 200 °C to 800 °C
- Surface area: ~ 800 m^2/g
- Thermal conductivity: 0.03 W/mK at RT (transient plane method)
- Colour : Translucent or opaque or black (depending on functionality)
- In-situ carbon doping for IR opacification possible
- Hydrophilic or hydrophobic

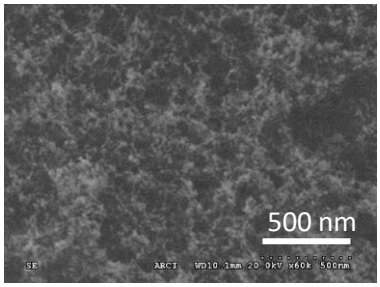


Optical Image of silica aerogel granules

Potential Applications

Thermal insulating

- Paints
- Building material such as cement, bricks, wall plaster etc
- Window panels
- Textiles
- Heat / cold storages



SEM image showing highly porous morphology in silica aerogel granules

Technology Readiness Level 5

- ~ 1kg of silica aerogel granules can be produced in one batch from presently available lab production facility

IPDI*	1	2	3	4	5	6	7	8	9	10
Activities	*Basic concepts and understanding of underlying scientific principles*	*Short listing possible applications*	*Research to prove technical feasibility for targeted application*	*Coupon level testing in stimulated conditions*	*Check repeatability/ consistency at coupon level*	*Prototype testing in real-life conditions*	*Check repeatability/ consistency at prototype level*	*Reassessing feasibility (IP, competition technology, commercial)*	*Initiate technology transfer*	*Support in stabilizing production*
Status										

Major Patents / Publications

1. Indian Patent No. **290370** : Improved method for producing carbon containing silica aerogel granules, Neha Hebalkar

Centre for Nanomaterials (CNAM)
ARCI, Balapur PO., Hyderabad 500005, Telangana, India
Tel : +91 40 24452447 / 24452334; Fax : +91 40 24442699
Email: neha [at] arci [dot] res [dot] in / vijay [at] arci [dot] res [dot] in / tata [at] arci [dot] res [dot] in