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22-26 October 2017

Cancun, Mexico

## Cavitation Technology

A Cleaner, Greener, Energy Efficient and Sustainable Processing Technique for Nanomaterials of Wider Technological Applications

By **Prof. Sivakumar Manickam**

22 Oct. 2017, Fiesta Americana Condesa All Inclusive Resort, Cancun, Mexico

### Short course:

**Fundamentals, Knowledge and Understanding on Cavitation Technology for Effective Utilisation in Nanotechnology**

The objective of this 1-day course is to introduce cavitation technology as an energy-efficient processing technique to generate a wider range of nanomaterials and nanoformulations. In these days clean and green processing techniques receive immense consideration in widespread technologies. In this connection, this workshop offers an excellent opportunity and anticipates revealing the participants to learn about the fundamentals, effective usage and technological applications of ultrasound and more importantly towards the generation of nanomaterials for extensive technological application. The principal attribute of this cleaner, greener and sustainable technique in the generation of nanomaterials lies in its capability of resulting in the following inherent advantages: (1) Results in a rapid reaction rate (2) Reactions can be carried out under milder conditions (3) Promote heterogeneous reactions involving multicomponents, mainly through increased mass transport and thermal effects (4) Avoids the use of toxic reagents and complicated organometallic precursors (5) Generates stable colloidal dispersion of nanoparticles (6) The produced nanoparticles are sometimes with unusual shape and interesting properties (7) Nanomaterials those are difficult if not impossible to produce by other conventional ways can be prepared and (8) This technique is highly energy efficient. With right learning and understanding, ultrasound could be employed in a cleaner and energy-efficient way. Besides, the discussion will be made about the translation of lab-to-plant scale along with the challenges and future directions.

An interactive session along with on-lecture monitoring and testing of learning (through e-quiz) will enhance the understanding and learning on this area further leading to potential exploitation of this technique.

**Course outline:**

<b>Subject topics</b>	
<b><u>1</u></b>	Ultrasound fundamentals – Energy sources, Cavitation, inherent advantages, Nucleation, Growth and Collapse
<b><u>2</u></b>	Parameters affecting cavitation and bubble collapse
<b><u>3</u></b>	Ultrasonic transducers: Bath and horn (sonotrode)
<b><u>4</u></b>	Low and high frequency reactors
<b><u>5</u></b>	Lab to large-scale reactors
<b><u>6</u></b>	Effects: Turbulence, microstreaming, shock waves
<b><u>7</u></b>	Classes of nanomaterials synthesised
<b><u>8</u></b>	Towards the C nanomaterials: CNT, Graphene and Fullerene
<b><u>9</u></b>	Nanoformulations
<b><u>10</u></b>	Developments on larger scale
<b><u>11</u></b>	Future directions

**Who should attend?**

Researchers, Scientists, Lecturers, Students, Technologists, Managers, Technopreneurs, Design and development engineers who want to understand a novel technique to generate nanomaterials and nanoformulations in an energy-efficient way.

**The participant will also receive:**

CD with course material in pdf

Certificate of completion

Lunch and refreshments

## **Course instructor Prof. Dr. Sivakumar Manickam**



*Professor Sivakumar Manickam (Siva)* has a vast knowledge and practice in designing ultrasound reactors and their applications in nanomaterials and thus it is an opportunity to learn this technique in a straightforward way through this workshop. He is a Chemical Engineer specializing Process Engineering of Nanomaterials especially Nanopharmaceuticals. He is working in the area of Ultrasound and Hydrodynamic Cavitation since 1997. He is working with University of Nottingham, Malaysia campus and his research group concentrates on the process development of cavitation based reactors towards technologically important nanomaterials. He is also Associate Dean of Research and Knowledge Exchange and is the Director of the Nanotechnology and Advanced Materials. He was also the recipient of JSPS fellowship, Japan. He has published more than 200 peer reviewed journal and conference papers. He is the Fellow of Royal Society of Chemistry (RSC), Fellow of Higher Education Academy (FHEA, UK) and member of Institute of Nanotechnology (IoN).

**Sivakumar Manickam, PhD Tech., FHEA (UK), FRSC**

**Professor of Chemical and Nanopharmaceutical Process Engineering**

**Associate Dean, Research and Knowledge Exchange**

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