

## Press release

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<http://www.efce.org>

### **Glotzer dazzles audience at Danckwerts chemical engineering lecture Assembly engineering – how far can one go on entropy?**

This was the burning question when Prof Sharon Glotzer of University of Michigan, US, delivered the 2013 Danckwerts Lecture to a spellbound audience of academic and industrial delegates at the 9th European Congress of Chemical Engineering in The Hague, The Netherlands.

Glotzer, the Stuart W Churchill collegiate professor of chemical engineering and professor of materials science presented her insights into *Assembly Engineering: Materials Design for the 21<sup>st</sup> Century*, which explores the core principles of assembly engineering and the application of these principles to the design and synthesis of next generation materials.

The emerging discipline is founded on understanding the influence of entropy, allied to advances in science and chemical engineering. Thanks to rapid screening facilitated by the latest developments in computer processing unit capabilities, Glotzer's team is working on a new 'periodic table' of material structures with order on the nanoscale if not the macroscale. These developments could allow formulation of the next generation of self-assembling materials to create unprecedented functionality, able, for instance, to flow through narrow gaps and reform, or change their properties according to their environment.

"It was dazzling," one delegate proclaimed. "What she is doing with crystalline structures is so far ahead of what the average engineer is used to."

While most students learn that entropy drives disorder, Glotzer finds that entropy can in some circumstances drive the creation of structure.

The new structures can be extraordinarily complex but in analysing the results, the Glotzer team shows that materials such as diamond, chiral structures, 'wood pile' structures and quasicrystals could display novel and useful optical properties. So far none of these forms is self-assembling, but by using an iterative scheme consistent with the target structure and analysing assembly pathways, Glotzer anticipates finding self-assembly solutions.

The key principles to consider when creating self-assembling particles are the building block attributes, binding and driving forces and the environment in which they will be assembling and a solid understanding of thermodynamic pathways, kinetics and dissipation. These factors determine the yield and quality of the structure. Assembly engineering then factors in the complexity of the building block against cost to create the simplest target structure with the highest yield.

In the audience was Peter Varey, leading scholar and biographer of the eponymous Peter Danckwerts. Varey commented: "The team that selects the Danckwerts lecture each year invariably comes up with something special. Sharon Glotzer was no exception."

For more information about the European Congress of Chemical Engineering, visit <http://www.ecce2013.eu/>

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### **Editor's Notes**

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### **About chemical engineers**

Chemical, biochemical and process engineering is the application of science, maths and economics to the process of turning raw materials into everyday products. Professional chemical engineers design, construct and manage process operations all over the world. Pharmaceuticals, food and drink, synthetic fibres and clean drinking water are just some of the products where chemical engineering plays a central role.

### **About EFCE**

Founded in 1953, The European Federation of Chemical Engineering (EFCE) is a non-profit-making association, whose object is to promote co-operation in Europe between non-profit-making professional scientific and technical societies in 30 countries for the general advancement of chemical engineering and as a means of furthering the development of chemical engineering. See [www.efce.org](http://www.efce.org)

### **About the Danckwerts Lecture**

Established in 1985 in memory of the late Prof Peter V Danckwerts GC MBE FRS, past president of the Institution of Chemical Engineers (IChemE), this lecture is co-sponsored by IChemE, EFCE, Elsevier and AIChE and presented in alternate years at the European Congress of Chemical Engineering and the American Institute of Chemical Engineering Annual Meeting. Danckwerts, a leading scholar, executive editor of *Chemical Engineering Science* and second Shell professor of chemical engineering at the University of Cambridge, is also remembered biographically by Peter Varey in his book entitled *Life on the edge: Peter Danckwerts GC MBE FRS*.

### **About Sharon Glotzer**

Sharon Glotzer is the Stuart W Churchill Collegiate Professor of Chemical Engineering and Professor of Materials Science and Engineering, at the University of Michigan, USA. She is an internationally-recognised scientist, with over 160 publications and over 250 invited, keynote and plenary talks on five continents. Prof Glotzer's research focuses on computational nanoscience and simulation of soft matter, self-assembly and materials design, and is sponsored by the US Department of Defense, US Department of Energy, US National Science Foundation, the JS McDonnell Foundation, and the Simons Foundation.