A new synthesising technique using nanotechnology may substantially lower costs in the drug-manufacturing process. Developed by the Singapore Institute of Bioengineering and Nanotechnology (IBN), the method simultaneously controls the size and the morphology of nanoparticles used in pharmaceutical synthesis and biomedical application.

The chemistry journal *Angewandte Chemie* recently featured this breakthrough. The researchers, Han Yu and Jackie Y Ying, developed a fluorocarbon-mediated synthesising technique that produces nanometre-sized particles of between 50 and 300nm with tuneable pore sizes in the range of 5–30nm. They have filed a United States patent on the invention.

Dubbed IBN-1 to IBN-5, the nanoporous nanoparticles represent a new class of materials tailored with both nanometre-scale particle size and nanometre-sized pores. Supramolecular chemistry has made possible the bottom-up manufacturing approach, where small molecules are assembled into bigger ones.

Currently, most methods can only produce particles limited in type of structure, degree of structural ordering, and range of pore size — usually two-dimensional hexagonal structures with small-pore diameter (< 5nm). Some require special vapour-phase synthesis equipment. IBN’s simple wet-chemical technique uses two types of soluble chemical compounds. One serves as the template for the basic porous structure, while the other keeps the growth of the particles to nanometre dimensions. This method can create a variety of nanoparticles with sizable surface areas and very well-defined pore size and structure.

These nanoporous particles have application in the production of pure chiral drugs, representing over one-third of all pharmaceutical drugs sold worldwide. Chiral drugs comprise so-called left-handed and right-handed molecules, which are mirror images of each other. Only one of these molecules provides therapeutic effect. In the production process, manufacturers use catalysts to synthesise selectively the preferred chiral molecule that offers therapeutic treatment without undesirable side effects. However, these catalysts normally exist in a homogeneous liquid phase, which makes it difficult to separate and reuse them.

The researchers at IBN have managed to immobilise these catalysts on their nanoporous materials, rendering the catalysts in solid form, which enables recovery and reuse via simple filtering or centrifuging processes. Efficient synthesis of a wide variety of pharmaceuticals can lead to greater savings because production of the chiral ingredient accounts for 10–40% of the total cost.

IBN’s nanoporous nanoparticles also have possible application in therapeutic treatments such as targeted drug delivery and gene therapy. Furthermore, the invention can be used to host quantum dots and magnetic nanoparticles for bioimaging and quantum-device applications.

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