

Ancient Technique Revived for Modern Microparticles

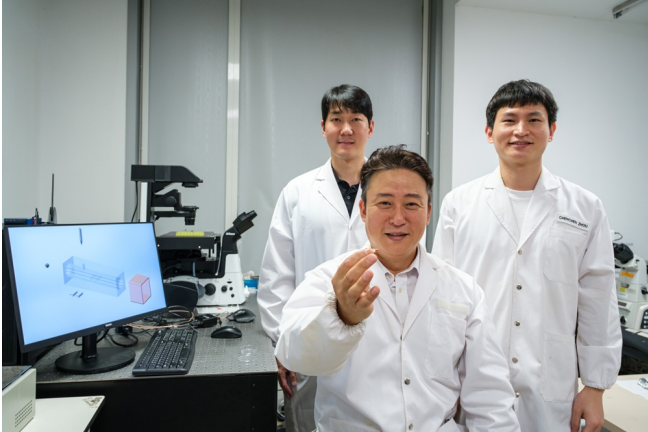


Image: Front Row: Prof Cho Nam Joon, holding the new microfluidics chip, which can make precise microceramic particles in various shapes. Behind him is PhD student Young Hwan Choe (rear left) and Research Fellow Dr Zhou Chenchen (right), from the NTU School of Materials Science and Engineering.

Inspired by the ancient East Asian method of constructing wooden structures using a "tongue and groove" technique, NTU Singapore scientists have developed a new approach to fabricating advanced ceramic microparticles, just slightly bigger than the width

of the human hair.

NTU materials scientists have used this approach to make a microfluidic chip that can produce and shape tiny ceramic microparticles with unprecedented complexity and precision.

These microparticles, with various intricate shapes and precise sizes such as ten-toothed gears or triangles with angled edges, could be used in a wide range of applications across microelectronics, aerospace, energy, and medical and mechanical engineering.

Conventional fabrication methods, such as micromachining and laser sintering, have limitations in resolution and the ability to mass-produce such tiny, intricate shapes.

The current methods struggle with achieving sharp-edged and non-transparent microparticles due to material properties and the tiny sizes of the microparticles.

In contrast, this new method significantly enhances the production rate - up to 10 times faster than current methods - and achieves unprecedented quality in the manufactured micro-ceramic particles.

The construction of the microfluidics chip was inspired by the historical building technique, known as "mortise and tenon" joinery, which uses interlocking grooves and tongues instead of nails or glue.

It was used to build palaces and residences in ancient China as early as 1000 BC, has been used in Korea since the 14th century for construction, and appears in Japanese temples. It is still prevalent in the traditional Korean "Hanok" architectural style and was used to build the Gyeongbokgung Palace in Seoul.