Press Releases

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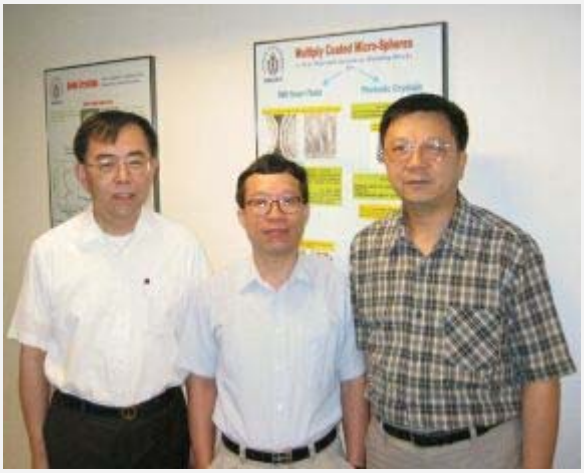
New Advances in Smart Fluids

Research achievements in dielectric electrorheological (ER) fluids made by researchers in the Physics Department of the Hong Kong University of Science and Technology (HKUST) were published in the latest issue of *Advances in Physics* (p 343, Vol 52, No 4, 1 June 2003), the number-one ranked journal in the field.

The research was conducted by Prof Ping Sheng, Head of the Department of Physics , Associate Professor Wing Yim Tam and Assistant Professor Weijia Wen.

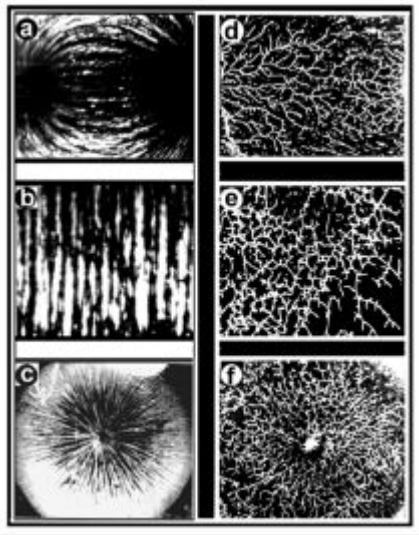


From left, Prof Ping Sheng, Dr Wing Yim Tam and Dr Weijia Wen

"Since 1995, our research on ER fluids has earned worldwide attention and recognition, with more than 20 articles appearing in prestigious journals such as *Physical Review Letters*, *Physical Review* and *Applied Physics Letters*," says Dr Weijia Wen. "More importantly, we've developed some very practical ER fluids, bringing our goal of turning ER fluids into commercially viable products one step closer to reality."

ER fluids are smart materials consisting of dielectric microparticles dispersed in an insulating liquid, usually silicon oil. When an external electric field is applied, they can be changed within a few milliseconds into a solid state but revert to liquids instantly when the current goes off. This process, called rheology, is reversible.

The unique properties of ER fluids make them ideal materials to transfer energy and control motion electronically. Potential applications can be found in mechanical devices that involve motion transmission, such as vibration dampers, shock absorbers, brakes, clutches, valves, and speed controllers.



chain/fractal transition of ER fluids

At HKUST, researchers have succeeded in developing a new generation of ER fluids with unique characteristics, opening up new ground in their study. These discoveries include so-called metal-coated dielectric spherical particles, which are capable of exhibiting a range of interesting phenomena, including "ground state structures of ER fluids", "structure-induced nonlinearity", and "fractals formed by conducting particles".

"We've also developed a prototype clutch that is more cost-effective, reliable, easy to use, and that has a longer lifespan than conventional designs," says Dr Wen. The University is currently seeking a US patent for the new ER fluid used in the clutch.

The ER fluids research was sponsored by the University, the Research Grants Council and the National Natural Science Foundation of China.