The Eindhoven University of Technology, Department of Mechanical Engineering has a vacancy for

PhD student “Full color display based on electrokinetic driving of nano-particle dispersions in microfluidic pixels”

Project
Electrokinetic effects are being used in various ways to drive fluid and particle motion in microfluidic systems, for diverse applications such as (bio-)chemical analysis and display principles. In this project, we focus on the latter. Electrophoretic displays are regarded as excellent candidates for electronic paper. This type of display consist of microfluidic pixels containing a non-aqueous solution, in which dispersions of two or more charged particles having different colors are actuated using electrophoresis. However, this approach has two important drawbacks: it is not possible (or at least very complex) to create a color display, and the mobility of electrophoretic particles in a liquid limits the switching speed of an electrophoretic display. As a solution to these limitations, we propose a novel display principle based on the concerted action of electro-osmosis and electrophoresis in a non-aqueous fluid. Theoretically, this “electrokinetic” display should be capable of meeting market expectations, such as full color and video rate while exhibiting full bi-stability. However, in practice, performance falls well short of this, and reasons are not always clear. It is paramount that a lack of understanding (immature theory, incomplete characterization of materials, improper analysis methods for devices, etc.) is at the basis of the discrepancy. The project will help the development of the electrokinetic display by creating fundamental understanding of particle and fluid motion in electro-kinetic nanoparticle dispersions by combining experiments and modeling, and by synthesis of color nanoparticles and stable dispersions suitable for electrokineatic switching. A final aim is the demonstration of a high-speed full color display prototype. The project will be conducted in close collaboration with South China National University (SCNU) and Guohua OET.

Requirements
We are looking for a scientist with a background in applied physics, chemical engineering, or mechanical engineering, who enjoys to work in a multidisciplinary academic environment and translate his/her knowledge towards applications. The ideal candidate would have experience in both microfluidics and particle physics / chemistry, but excellent candidates with a background in one area (and an interest to master the other) will also be considered. Important personal skills include a proven ability to manage projects, collaborate with external parties and be self-driven.

Embedding
The PhD student will be embedded in the Microsystems group headed by prof.dr.ir. Jaap den Toonder, in close collaboration with the Stimuli-responsive Functional Materials & Devices (SFD) group headed by prof.dr. Albert Schenning. Both research groups are part of the Institute of Complex Molecular Systems (ICMS). The Microsystems group manages the Microfab lab, a state-of-the-art micro fabrication facility that houses a range of micro manufacturing technologies – microfluidics technology is one of the main research pillars of the group. The SFD group develops polymers with new responsive functionalities and integrate them into devices to meet industrial and societal challenges in the fields of sustainable energy, healthcare & personal comfort. The project is a collaboration with the Electronic Paper Display Institute at South China National University, prof.dr. Alex Henzen, at Guangzhou China. Extended visits to SCNU are foreseen.

Employment conditions
We offer you:

- An exciting job in a dynamic work environment
- A full time appointment for four years by Eindhoven University of Technology (www.tue.nl/en)
• A gross monthly salary in line with the Collective Agreement for Dutch Universities.
• The possibility to present your work at international conferences.
• A personal development program for PhD students (Information on the PROOF program can be found on: https://www.tue.nl/en/university/working-at-tue/development-and-career/scientific-personnel/phd-and-postdoc/providing-opportunities-for-phd-students-3tu/)
• An attractive package of fringe benefits, including end-of-year bonus (8,3% in December), an extra holiday allowance (8% in May), moving expenses and excellent sports facilities.

Further information can be obtained from: Prof.dr.ir. J.M.J. den Toonder, phone +31 40 247 5706 and e-mail j.m.j.d.toonder@tue.nl.

Your application can be addressed to Prof.dr.ir. J.M.J. den Toonder. Applications must include a personal motivation letter, a Curriculum Vitae including the names and contact details of at least two references. Only complete applications will be considered. Consideration of the candidates will begin immediately, until the position is filled.