

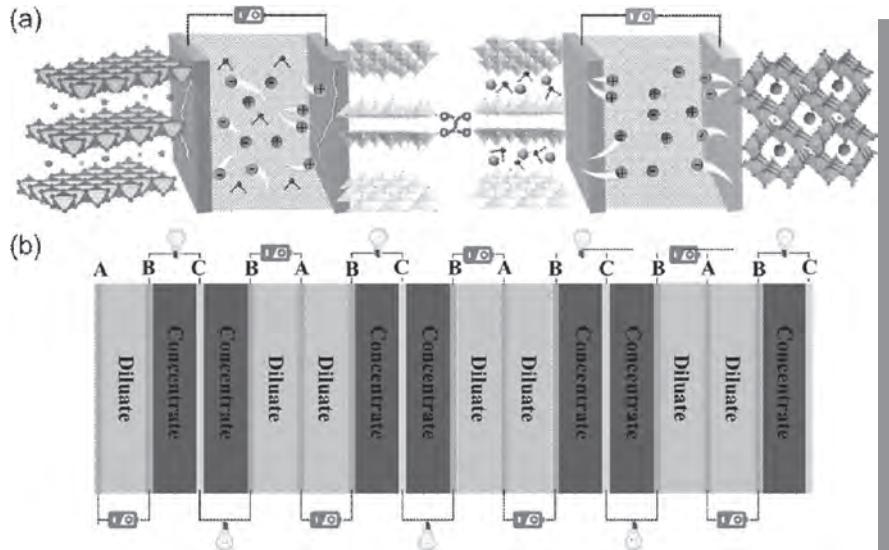
WOMEN IN ENGINEERING

Hui-Ying Yang—MATERIAL SCIENCES IN SERVICE OF SOCIETY DEVELOPMENT



Water and energy are intimately linked to greater economic development and advancement of society as a whole. Often,

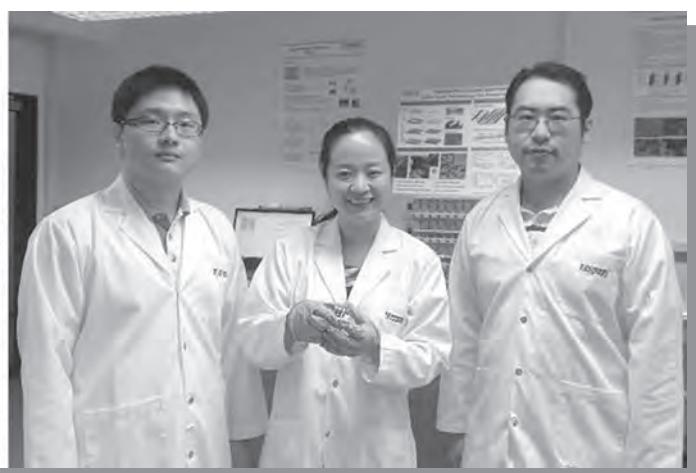
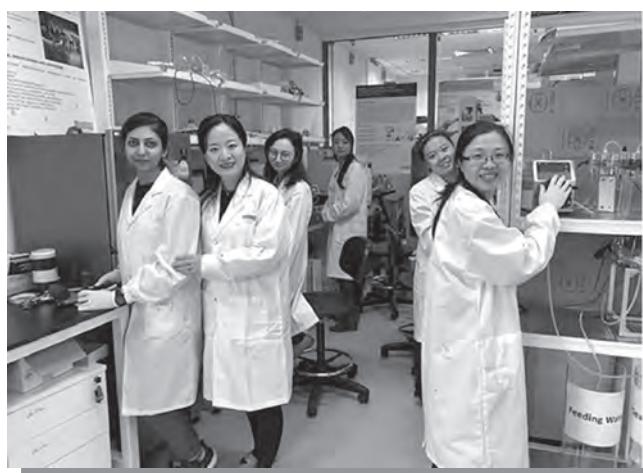
we are forced into a dilemma where one is prized over the other and times when energy is the victor, society is left in thirst. The main problem with modern desalination techniques is a high cost of energy which necessitates huge capital investments in infrastructure, technology, and manpower. However, Prof. Yang, a world-renowned materials scientist, and her team have managed to disrupt this through smart nanoscale fabrication techniques which have enabled the development of low energy desalinators. Her ideas for low energy desalinators are fundamentally built on sound concepts of electrochemistry and under her leadership, her research team pioneered the



Desalination process based on Nanomaterials

cross-disciplinary development of converting battery materials for use in water desalination and treatment, achieving a revolutionary desalination battery system which can perform both functions simultaneously. By utilizing redox-active (able to undergo chemical reactions with salt

ions) electrodes, seawater behaves like an electrolyte and desalination can be analogously treated as charging a battery. No one-size-fits-all solution exists to solve problems of water security and energy concurrently, but the desalination battery comes close. By developing



Prof. Hui-Ying Yang with her team members in a laboratory

energy-efficient desalinators, Prof. Yang has essentially untethered the relationship between energy and water and provided resource-scarce countries with an alternative solution to their water woes. To add on, these desalinators require little infrastructure and can be designed as a distributed water network system. The crux of these desalinators lies with the nanomaterials comprising it. Her team can fabricate nanomaterials with unique selectivity towards certain ions and a cascading series of these devices can substantially alter the composition of input water to fit agricultural, medical, industrial, or domestic needs. Her most recent accomplishment was adapting a variant of an electrochemical desalinator for dialysis treatment to regenerate used dialysates for portable dialysis systems. This technology was also developed for seawater mineral mining operations and her recent work showed how lithium metal ions can be extracted with high efficiency from seawater. Her futuristic vision is to achieve complete mitigation of water and energy problems through a combination of advanced nanofabrication and electrochemistry.

She has devoted her efforts to educate the next generation of young students and to multidisciplinary collaborative projects in practical applications of energy storage and water treatment. Her creative ideas, profound knowledge and extensive experience in water research led to existing economic benefits, significant educational impacts, enormous social benefits, and many intellectual properties/publications/books. In particular, she has been the UN Women Ambassador for Young Women in Science, Technology, Engineering and Math (STEM) in Singapore since 2014. At this position she has supported female scientists in many ways and motivated young girls to excel in science.

Professor Hui-Ying Yang did her Ph.D from Nanyang Technological University, Singapore in 2007. During 2008-2010, she was Lee Kuan Yew Fellow, School of Electrical and Electronic Engineering, Nanyang Technological University, Singapore. She was Assistant Professor from 2010-2016 at Singapore University of Technology and Design and at present she is Programme Director, Nano-electronic Engineering and Design, Singapore

University of Technology and Design. She has handled more than 25 major research projects with a cumulative worth of 15 million Singapore dollars. She has received more than 20 International and National Awards including SUTD Research Excellence Award, Singapore University of Technology and Design (2021); Fellow of Royal Society of Chemistry, UK (2020); IPS Nanotechnology Medal (Outstanding Nanotechnology Physics Research), Institute of Physics Singapore (2018); Outstanding Young Manufacturing Engineer Award, Society of Manufacturing Engineers (SME), USA (2014). Yang has published more than 270 peer-reviewed articles in many prestigious international journals, such as Nature Communications, Nano letters, ACS Nano, Advanced Materials and so on. From Google Scholar, her work has been cited over 12000 times. Her H-index is 61. She also has given 50+ invited talks and 100+ conference presentations. Yang is Singapore's all-time 32nd most prolific researcher for materials science publications in top international journals. Among Singapore's all-time top 40, her category normalized citation impact (CNCI) ranks 19th. She is among the youngest in the top 40 list.