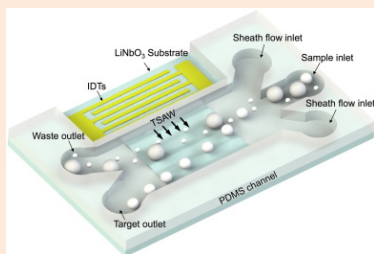


A regular update featuring works by SUTD Faculty, Researchers, Students and Research Centres/Labs. We hope to create awareness of the Research by SUTD within the SUTD community and beyond. Share with us your SUTD works today so that we can include it in our next update.

CHEMISTRY – MICROPARTICLE

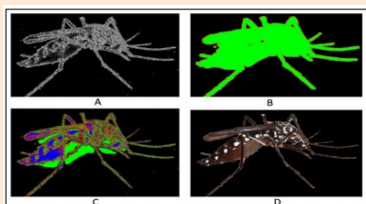


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Ma, Z., Collins, D. J., & Ai, Y. (2017). Single-actuator Bandpass Microparticle Filtration via Traveling Surface Acoustic Waves. *Colloid and Interface Science Communications*, 16, 6-9.

In this research work, the researchers realize a single surface acoustic wave (SAW) actuated bandpass filter that can selectively sort out particles with varying diameters. 15.2 μm polystyrene particles out of 10.2 μm and 19.5 μm ones, 10.2 μm particles out of 8.0 μm and 11.8 μm ones, were validated through this research. Successful acoustic based microparticle filtration will aid in medical diagnostics and biological analysis applications.

CHEMISTRY – MOSQUITO CLASSIFICATION

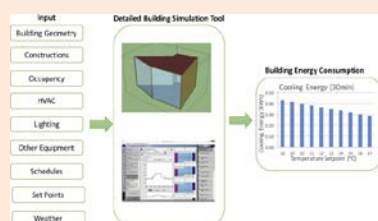


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Fuchida, M.; Pathmakumar, T.; Mohan, R.E.; Tan, N.; Nakamura, A. (2017). Vision-Based Perception and Classification of Mosquitoes Using Support Vector Machine. *Appl. Sci.*, 7, 51.

The authors presented an automated vision-based mosquito classification module that can be used in closed-areas of mosquito inhabitants. The module is able to identify mosquitoes from other bugs such as bees and flies through retrieving the morphological features, followed by support vector machine-based classification. This method proves to be an efficient alternative to traditional methods for mosquito surveillance, mapping and sample collection.

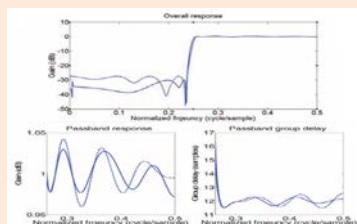
CONSTRUCTION & BUILDING TECHNOLOGY – ENERGY



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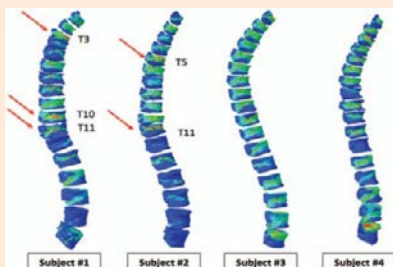
Tushar, W., Tao, W., Lan, L., Xu, Y., Withanage, C., Yuen, C., & Wood, K. (2017). Policy Design for Controlling Set-Point Temperature of ACs in Shared Spaces of Buildings. *Energy and Buildings*, 134, 105-114

The research paper recommended an energy policy for an office shared space through an established temperature control device. The energy policy allowed users to be responsible for the "payment" on the energy consumption of the shared office space while users are satisfied either via thermal comfort or through incentives.

ENGINEERING -
ELECTRICAL & ELECTRONIC
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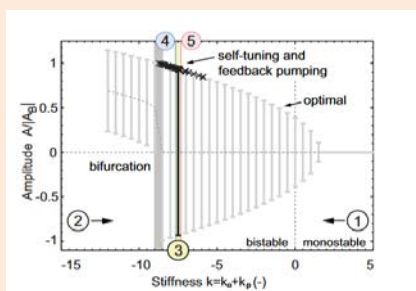
Chen, J. and Tan, J.H. (2016, October 25-28). Low complexity and quasi-linear phase IIR filters design based on iterative convex optimization. *2016 IEEE Asia Pacific Conference on Circuits and Systems (APCCAS)*.

Infinite impulse response (IIR) digital filters are commonly employed for digital signal processing, control and communication, as they do not require as much memory and arithmetic operators relative to finite impulse response (FIR) filters. Reduced complexity in IIR filter structure, however, compromises non-linear phase response. To mitigate this, an iterative optimization technique for designing IIR digital filters that had stable group delay was suggested. The designed filter in this study was found to significantly reduce group delay deviation relative to multiple state-of-art IIR design techniques.

MEDICINE -
FINITE ELEMENT ANALYSIS
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Anitha, D., Thomas, B., Jan, K., & Subburaj, K. (2017). Risk of vertebral compression fractures in multiple myeloma patients. *Medicine*, 96(2), 5825-1-8.

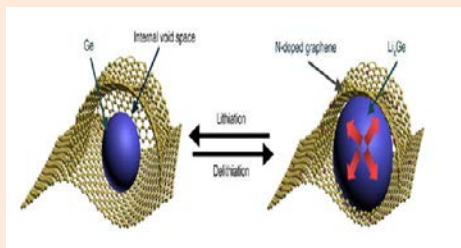
Finite element (FE) analysis was proposed because bone mineral density (BMD) scans cannot reliably predict fracture risk in MM patients. FE analysis estimates vertebral bone strength in vitro through multi-detector computed tomography (MDCT) images. MM patients with and without vertebral compression fractures were differentiated through FE analysis carried out on vertebrae segments (T1-L5) from MDCT imaging scans. Then, MDCT-based FE models were derived from the in vitro vertebrae samples and were then applied to the in vivo vertebrae segments of MM patients after validation.

PHYSICS -
FLUIDS & PLASMAS
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Braun, D., Sutas, A., & Vijayakumar, S. (2017). Self-tuning bistable parametric feedback oscillator: Near-optimal amplitude maximization without model information. *Physical Review E*, 95(1), 012201-1-9.

For flexible and wearable devices, flexible electrochemical energy storage devices appear to be a good power source. However, it is currently difficult to design an electrode structure that has good flexibility, high capacity, high rate of charging and discharging and long lifetime. Thus the authors designed a three-dimensional (3D) interconnected porous nitrogen-doped graphene foam that had an encapsulated structure. It has high specific reversible capacity, high charging rate and can last up to 1000 charging-discharging cycles.

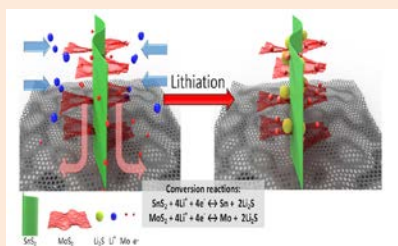
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SCIENCE & TECNOLOGY –
GRAPHENE

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Mo, R., Rooney, D., Sun, K., & Yang, H.Y. (2017). 3D nitrogen-doped graphene foam with encapsulated germanium/nitrogen-doped graphene yolk-shell nanoarchitecture for high-performance flexible Li-ion battery. *Nature Communications*, 8, 13949-1-9.

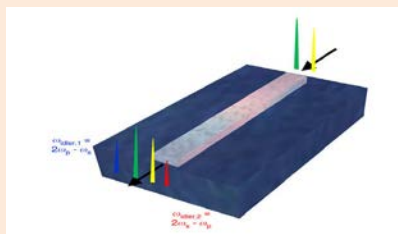
For flexible and wearable devices, flexible electrochemical energy storage devices appear to be a good power source. However, it is currently difficult to design an electrode structure that has good flexibility, high capacity, high rate of charging and discharging and long lifetime. Thus the authors designed a three-dimensional (3D) interconnected porous nitrogen-doped graphene foam that had an encapsulated structure. It has high specific reversible capacity, high charging rate and can last up to 1000 charging-discharging cycles.

SCIENCE & TECNOLOGY –
LITHIUM ION BATTERIES

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Huang, Z., Wang, Y., Liu, B., Kong, D., Zhang, J., Chen, T., & Yang, H.Y. (2017). Unlocking the potential of SnS₂: Transition metal catalyzed utilization of reversible conversion and alloying reactions. *Scientific Reports*, 7, 41015-1-11.

In this paper, the authors discussed how transition metal molybdenum (Mo) can be employed as a catalyst in sulphide (SnS₂) anode. It was found that in the presence of Mo, Sn can be converted to SnS₂ reversibly. Mo catalyst in MoS₂ was placed upon self-assembled vertical SnS₂ nanosheets upon three-dimensional graphene to produce a new structure with strong electrochemical properties. This was found to increase the lithium storage capability of SnS₂.

SCIENCE & TECNOLOGY –
WAVE-GUIDES

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Ooi, K.J.A., Ng, D.K.T., Wang, T., Chee, A.K.L., Ng, S.K., Ang, L.K., Tan, D.T.H. & Wang, Q. et al. (2017). Pushing the limits of CMOS optical parametric amplifiers with USRN:Si₇N₃ above the two-photon absorption edge. *Nature Communications*, 8, 13878-1-10.

Read about the design of an ultra-silicon-rich nitride (USRN) in the form of Si₇N₃ which came about due to bandgap engineering of non-stoichiometric silicon nitride. The designed USRN was found to have high optical parametric gain and high wave-guide conversion efficiency. It is projected that eventually USRNs could be used in high-performance nonlinear optical pulse compressors and low power, ultra-broadband light sources.