Prof. Hsisheng Teng

鄧熙聖 教授

Ph.D.： Engineering, Brown University, 1992

M.S.： Engineering, Brown University, 1991

B.S.： Chemical Engineering, National Cheng Kung University,1984

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Research Interests

Photocatalytic Water Splitting;
Photoluminscence Materials;
Electrochemical Supercapacitors;
Graphene Oxide Nanostructure;
Lithium Ion Battery

Research Awards and Honors:

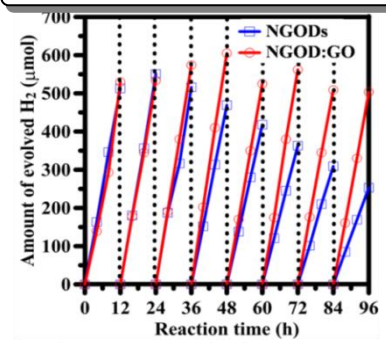
1. Research Excellence Award, Ministry of Science and Technology (2003, 2011, 2014)
2. University Chair Professor, National Cheng Kung University (2012)
3. Outstanding Engineering Professor Award, Chinese Institute of Engineers (2012)
4. Coordinator, Chemical Engineering Program, National Science Council (2012-14)
5. Outstanding Research Paper Award, Catalysis Society of Taiwan (2015)
6. Thomson Reuters Taiwan Research Front Awards, Thomson Reuters (2011)

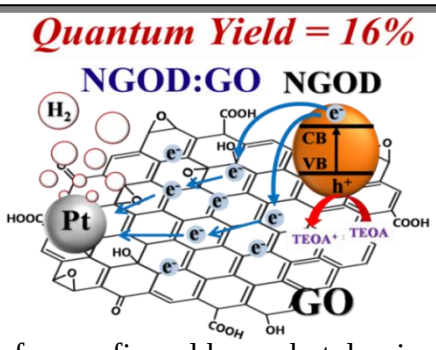
Representative Publications

1. Huang, H.C.; Chung, C.J.; Hsieh, C.T.; Kuo, P.L.; Teng, H.*, *Nano Energy* 2016, 21, 90-105.
2. Yeh, T.F.; Teng, C.Y.; Chen, L.C.; Chen, S.J.; Teng, H*, *Journal of Materials Chemistry A* 2016, 4, 2014-2048.
3. Yeh, T.F.; Chen, S.J.; Teng, H.*, *Nano Energy* 2015, Vol. 12, 476-485.
4. Yeh, T.F.; Teng, C.Y.; Chen, S.J.; Teng, H.*, *Advanced Materials* 2014 (05), Vol. 26, 3297-3303.
5. Yeh, T.F.; Cihlář, J.; Chang, C.Y.; Cheng, C.; Teng, H.*, *Materials Today* 2013, 16, 78.
6. Li, T.L.; Lee, Y.L.; Teng, H.*, *Energy & Environmental Science* 2012, 5, 5315.
7. Yeh, T.F.; Syu, J.M.; Cheng, C.; Chang, T.H.; Teng, H.* *Advanced Functional Materials* 2010, 20, 2255.

Research

Graphene Oxide Quantum Dots for Photocatalytic Water Splitting

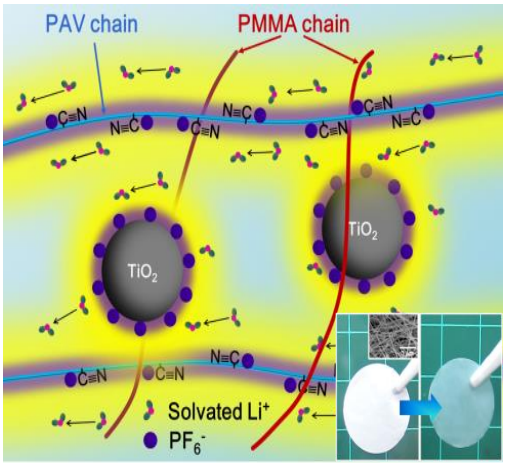


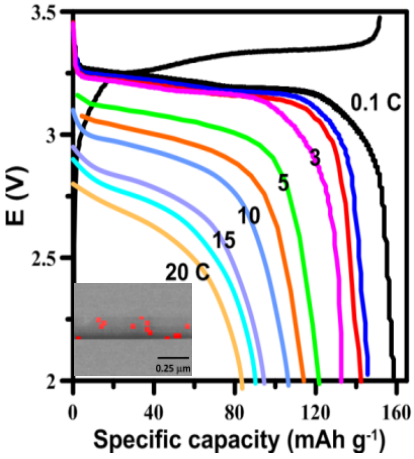


Incorporating nitrogen-doped graphene oxide dots (NGODs) with graphene oxide (GO) sheets to form a stable and effective NGOD:GO composite for photocatalytic H_2 production through water splitting under visible light illumination.

This vectorial electron transfer, confirmed by a photoluminescence spectroscopy analysis, led to the relocation of the reaction sites from the NGODs to the GO sheets, protecting the NGODs from attack by reaction intermediates. The catalyst steadily catalyzed H_2 production from a 10 vol% aqueous solution of triethanolamine under visible light illumination for 96 h, unlike a NGOD catalyst that exhibited an activity decay of 50% within 96 h. The apparent quantum yield of H_2 under 420-nm light irradiation was 16.0%, demonstrating the high activity of the NGOD:GO catalyst.

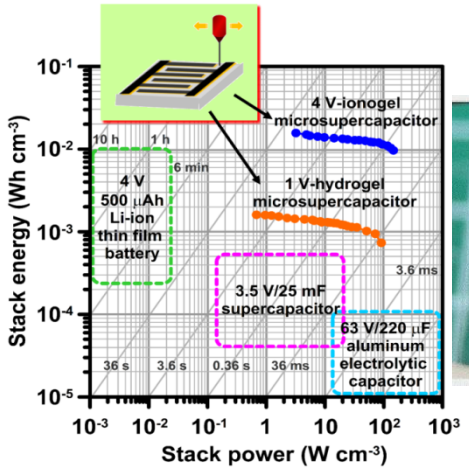
Gel Polymer Electrolytes for Lithium Ion Batteries

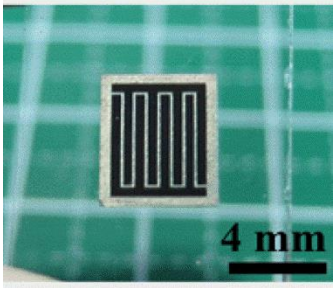




A TiO_2-decorated polymer framework adsorbs PF_6^- anions to create space-charge regimes in polymer electrolyte (GPE). The resulting full-cell graphite|GPE|$LiFePO_4$ battery has high capacities of 152 and 84 mAh g^{-1} at 0.1 and 20 C, and exhibits the retention of 71% after 1000 cycles at 20 C.

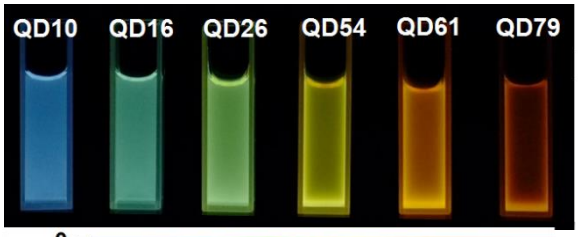
All-Solid-State Microsupercapacitors by Laser Fabrication

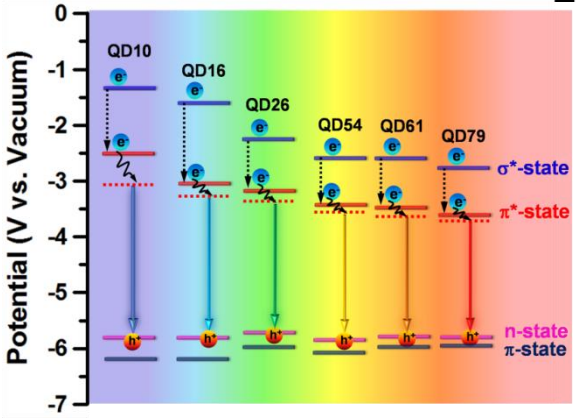




Microsupercapacitors (MSCs) are fabricated using a laser writer to produce in-plane interdigitated microelectrodes, activated mesophase pitch with hierarchical pore structure as the electrode material, and hydrogel and ionogel as the electrolytes. The MSCs show ultrahigh stack volumetric energy and power, which are comparable to Li-ion thin film batteries and aluminum electrolytic capacitors, respectively.

Quantum Confinement in Graphene Oxide Dots





This is the first study to unravel the electronic properties and mechanisms involved in photoluminescence (PL) emissions from graphene oxide quantum dots (GOQDs). We developed a method for synthesizing GOQDs emitting excitation-wavelength-independent PL, with the luminescence colour varying with the QD size. Top figure: the values following "QD" represent the particle size in angstrom.

The PL of each GOQD specimen was associated with the transition of electrons from the antibonding π (π*) orbital to oxygen non-bonding (n-states) orbitals. The observed quantum confinement is ascribed to the change in the size of the sp^2 domains, which lead to a change in the π–π* energy gap; the n-state levels remain unaffected by the change in size. Bottom figure: schematic energy level diagram for GOQD specimens.