

# Journal of Materials Chemistry C

Materials for optical, magnetic and electronic devices

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## IN THIS ISSUE

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### Cover

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### Inside cover

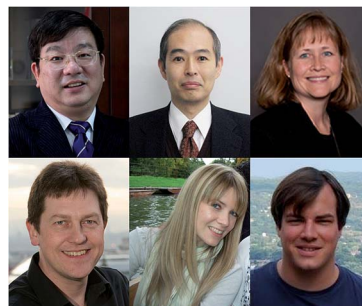
See Cheuk-Lam Ho, Qiang Zhao, Wai-Yeung Wong *et al.*, pp. 66–72. Image reproduced by permission of Wai-Yeung Wong from *J. Mater. Chem. C*, 2015, 3, 66.

## EDITORIAL

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### Journal of Materials Chemistry A, B & C: onwards and upwards

Dongyuan Zhao, Hiroshi Imahori, Christine Schmidt, Peter Skabara, Fiona McKenzie and Sam Keltie look over the highlights of the past year from *Journal of Materials Chemistry A, B & C* and look forward to 2015.



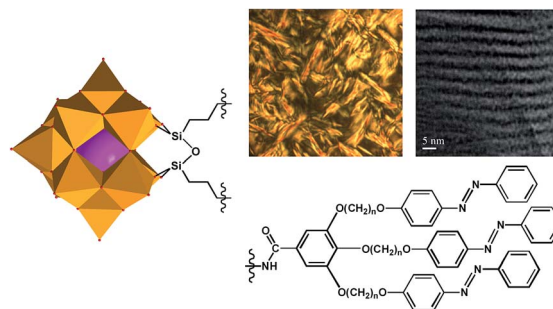
## COMMUNICATIONS

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### Covalently grafting nonmesogenic moieties onto polyoxometalate for fabrication of thermotropic liquid-crystalline nanomaterials

Chang-Gen Lin, Wei Chen, Solomon Omwoma and Yu-Fei Song\*

We demonstrated the first class of polyoxometalate-containing thermotropic liquid-crystalline materials constructed from nonmesogenic moieties.



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# Journal of Materials Chemistry C

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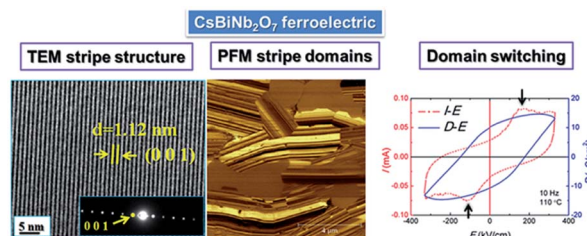


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### Ferroelectricity in Dion–Jacobson ABiNb<sub>2</sub>O<sub>7</sub> (A = Rb, Cs) compounds

Chen Chen, Huanpo Ning, Serban Lepadatu, Markys Cain, Haixue Yan and Mike J. Reece\*

Ferroelectricity and piezoelectricity in CsBiNb<sub>2</sub>O<sub>7</sub> are demonstrated for the first time.

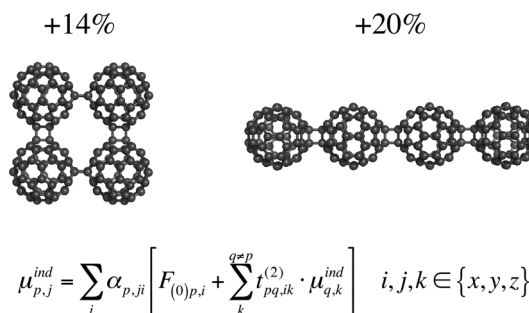


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### Rapid determination of polarizability exaltation in fullerene-based nanostructures

M. Swart and P. Th. van Duijnen

Exaltation of polarizability of C<sub>60</sub> fullerene nanostructures obtained in seconds with Thole's model.

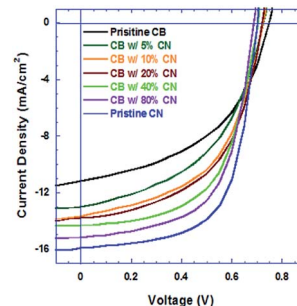


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### Efficient polymer solar cells fabricated from solvent processing additive solution

Chao Yi, Xiaowen Hu, Huckleberry C. Liu, Rundong Hu, Chin-Hao Hsu, Jie Zheng and Xiong Gong\*

In this study, high concentration or pure high boiling temperature solvent, chloronaphthalene (CN) was used as solvent for fabrications of efficient PSCs. The effects of high concentrations/purity of CN as solvent on device performances were reported.

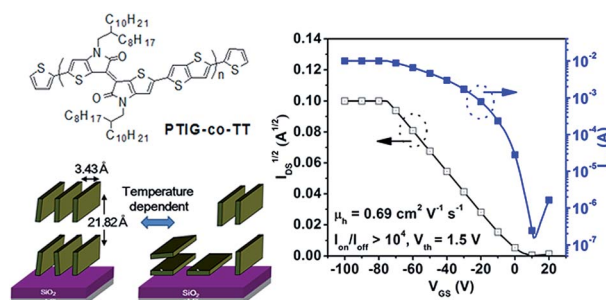


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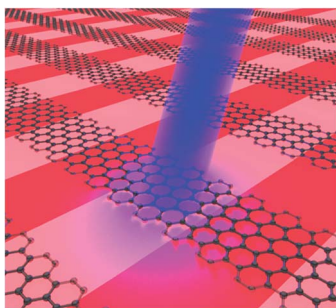
### Thienoisindigo-based copolymer with fused thieno [3,2-*b*]thiophene as a donor in thin film transistor applications with high performance

Chi-Min Chen, Sunil Sharma, Yi-Lun Li, Jey-Jau Lee and Show-An Chen\*

A thienoisindigo-based copolymer with thieno[3,2-*b*]-thiophene as a donor shows a temperature-dependent orientation of its chains, and a hole mobility up to 0.69 cm<sup>2</sup> V<sup>-1</sup> s<sup>-1</sup> has been achieved.



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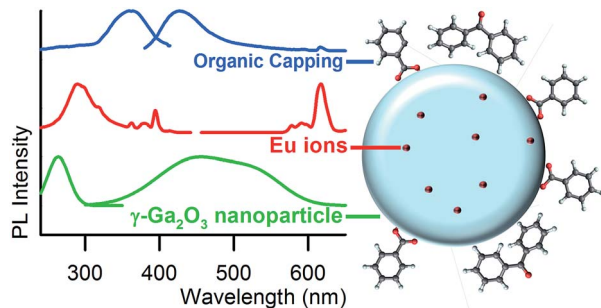


### High-performance deformable photoswitches with p-doped graphene as the top window electrode

Rongjin Li, Zhaoyang Liu, Khaled Parvez, Xinliang Feng\* and Klaus Müllen\*

Deformable polymer photoswitches with p-doped single layer graphene as the top window electrode exhibit an on/off ratio as high as  $8.5 \times 10^5$ .

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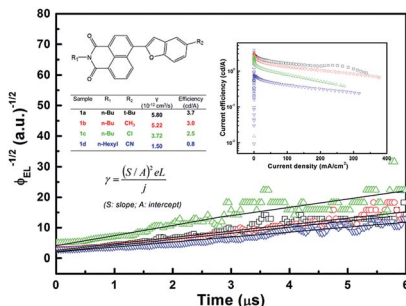


### Non-aqueous sol–gel synthesis of hybrid rare-earth-doped $\gamma$ -Ga<sub>2</sub>O<sub>3</sub> nanoparticles with multiple organic–inorganic-ionic light-emission features

Roberto Lorenzi,\* Alberto Paleari, Nikita V. Golubev, Elena S. Ignat'eva, Vladimir N. Sigaev, Markus Niederberger and Alessandro Lauria\*

Pure and Eu-doped  $\gamma$ -Ga<sub>2</sub>O<sub>3</sub> nanopowders with an organic capping layer were obtained by a benzyl alcohol route. Photoluminescence experiments allowed assigning the strong blue light emission to an aromatic ketone derivative.

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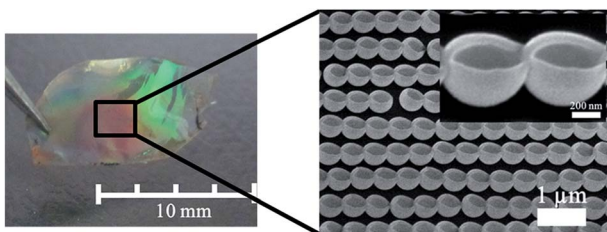


### Effects of side groups on the kinetics of charge carrier recombination in dye molecule-doped multilayer organic light-emitting diodes

Shengwei Shi,\* Feng Gao, Zhengyi Sun, Yiqiang Zhan, Mats Fahlman and Dongge Ma

Effects of side groups on the kinetics of charge carrier recombination are investigated in dye molecule-doped multilayer organic light-emitting diodes by transient electroluminescence.

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### Aligned gold nanobowl arrays: their fabrication, anisotropic optical response and optical grating applications

Xinyang Li, Yanchun Wu, Lifeng Hang, Dandan Men, Weiping Cai and Yue Li\*

Aligned Au nanobowl arrays on a flexible film with specific optical properties were obtained by combining template-assisted self-assembly and colloidal lithography.

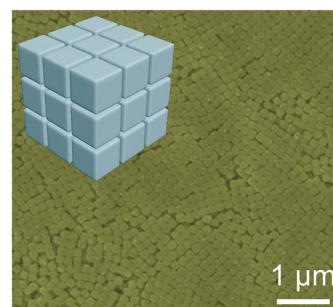


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### Silver chlorobromide nanocubes with significantly improved uniformity: synthesis and assembly into photonic crystals

Zheng Li, John S. Okasinski,<sup>\*</sup> David J. Gosztola, Yang Ren and Yugang Sun<sup>\*</sup>

Silver chlorobromide nanocubes with a highly pure crystalline phase and mono-dispersed size distribution are prepared by deliberately tuning the nucleation and growth process.

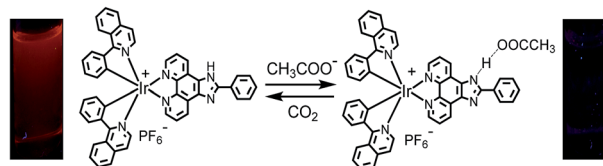


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### A charged iridophosphor for time-resolved luminescent CO<sub>2</sub> gas identification

Yun Ma, Hang Xu, Yi Zeng, Cheuk-Lam Ho,<sup>\*</sup> Chung-Hin Chui, Qiang Zhao,<sup>\*</sup> Wei Huang and Wai-Yeung Wong<sup>\*</sup>

A phosphorescent probe based on a long-lived iridium(III) complex has been developed for time-resolved CO<sub>2</sub> gas identification with high selectivity and photostability.

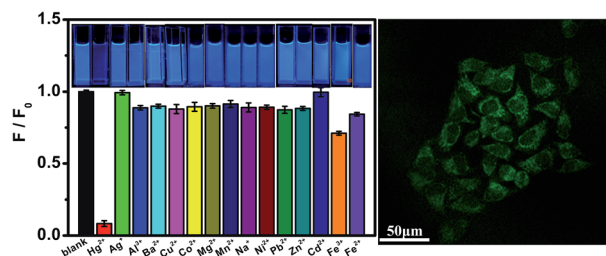


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### Facile synthesis of oxygen and sulfur co-doped graphitic carbon nitride fluorescent quantum dots and their application for mercury(II) detection and bioimaging

Ya-Chun Lu, Jia Chen, Ai-Jun Wang, Ning Bao, Jiu-Ju Feng,<sup>\*</sup> Weiping Wang and Linxiang Shao<sup>\*</sup>

We developed a facile one-step route for the synthesis of blue fluorescent OS-GCNQDs, which exhibited improved selectivity and sensitivity for Hg<sup>2+</sup> detection, and lower cytotoxicity for cell imaging.

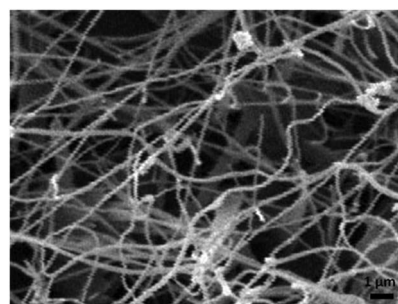


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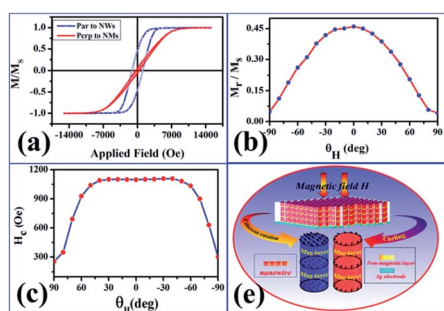
### Formation of double helical microfibrils from small molecules

Xianbin Jia, Shiyun Lou, Honglei Yuan, Ruijian Yuan, Shasha Tian, Chunyu Niu, Xinjuan Li and Shaomin Zhou<sup>\*</sup>

Using a facile vapor–solid route, double helical, organic, small molecular microfibril, *i.e.* 3,4,9,10-perylenetetracarboxylic dianhydride (PTCDA) was synthesized, which was based on the spontaneous twisting of supramolecular microtubes.



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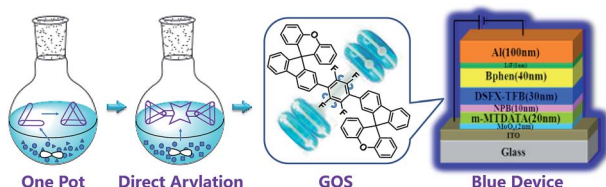


### Nanoscale characterisation and magnetic properties of $\text{Co}_{81}\text{Cu}_{19}/\text{Cu}$ multilayer nanowires

Junwei Zhang, Hongbin Ma, Senfu Zhang, Hong Zhang, Xia Deng, Qianqian Lan, Desheng Xue, Feiming Bai, Nigel J. Mellors and Yong Peng\*

Bamboo-like CoCu/Cu multilayer nanowires have been successfully fabricated into anodic aluminium oxide templates using an electrodeposition method, and their basic morphological, chemical, structural information and magnetic reversal mechanism have been highlighted.

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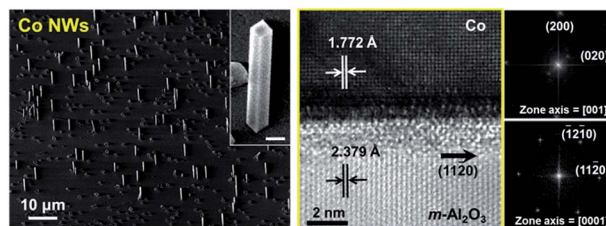


### Nondoped deep-blue spirofluorenexanthene-based green organic semiconductors (GOS) via a pot, atom and step economic (PASE) route combining direct arylation with tandem reaction

Ming-Li Sun, Wen-Sai Zhu, Zhen-Song Zhang, Chang-Jin Ou, Ling-Hai Xie,\* Yang Yang, Yan Qian, Yi Zhao and Wei Huang\*

We demonstrated a PASE route by combining direct arylation with one-pot/tandem reaction to synthesize a GOS DSFX-TFB for OLEDs with EQE of 4.1%.

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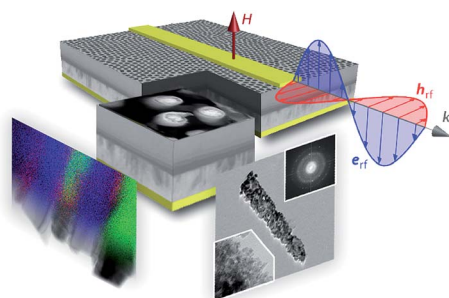


### Epitaxy-driven vertical growth of single-crystalline cobalt nanowire arrays by chemical vapor deposition

Si-in Kim, Hana Yoon, Hyoban Lee, Sunghun Lee, Younghun Jo, Sungyul Lee,\* Jaebum Choo\* and Bongsoo Kim\*

Ferromagnetic single-crystalline Co nanowires (NWs) aligned in a vertical orientation are epitaxially grown on *m*-cut sapphire substrates by a rapid and versatile chemical vapor deposition method. They were transformed into  $\text{Co}_3\text{O}_4$  nanotubes by thermal annealing under dilute  $\text{O}_2$  conditions.

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### Synthesis and magnetic properties of Ni– $\text{BaTiO}_3$ nanocable arrays within ordered anodic alumina templates

D. Sallagoity, C. Elissalde,\* J. Majimel, R. Berthelot, U. Chan Chung, N. Penin, M. Maglione, V. A. Antohe, G. Hamoir, F. Abreu Araujo and L. Piraux

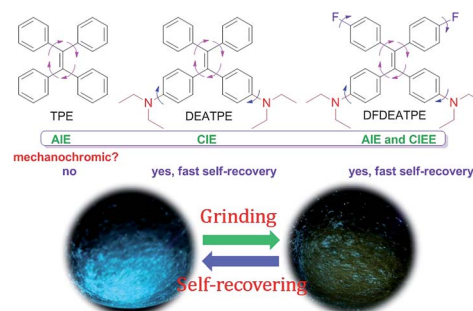
Modulation of magnetic properties and magnetoelectric coupling enhancement provided by ferromagnetic (Ni)/dielectric ( $\text{BaTiO}_3$ ) coaxial nanocable arrays.

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## Diethylamino functionalized tetraphenylethenes: structural and electronic modulation of photophysical properties, implication for the CIE mechanism and application to cell imaging

Yiliu Lin, Gan Chen, Lifang Zhao, Wang Zhang Yuan,<sup>\*</sup> Yongming Zhang<sup>\*</sup> and Ben Zhong Tang<sup>\*</sup>

Photophysical properties of TPE derivatives can be effectively modulated through decoration of TPE with diethylamino, fluorine and cyano moieties.

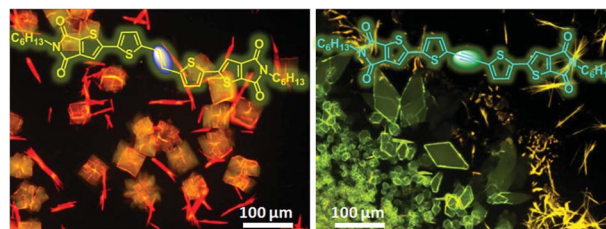


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## Synergic effect of unsaturated inner bridges and polymorphism for tuning the optoelectronic properties of 2,3-thieno(bis)imide based materials

Massimo Zambianchi, Laura Favaretto, Margherita Durso, Cristian Bettini, Alberto Zanelli, Ilse Manet, Massimo Gazzano, Lucia Maini, Denis Gentili, Stefano Toffanin, Federico Gallino, Michele Muccini, Massimiliano Cavallini<sup>\*</sup> and Manuela Melucci<sup>\*</sup>

We report the synthesis, structure-property relationships investigation of three new polymorphic 2,3-thieno(bis)imide molecular materials (NTE, NTI and NTA).

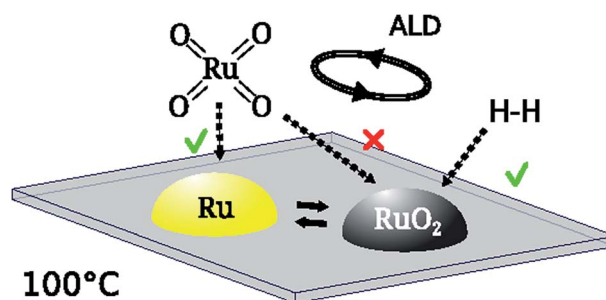


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## Atomic layer deposition of ruthenium at 100 °C using the RuO<sub>4</sub>-precursor and H<sub>2</sub>

Matthias M. Minjauw, Jolien Dendooven, Boris Capon, Marc Schaeckers and Christophe Detavernier<sup>\*</sup>

A novel Ru ALD process at 100 °C using the inorganic RuO<sub>4</sub>-precursor in a reduction chemistry with H<sub>2</sub> is being reported, and a proposal for the underlying reaction mechanism is given.

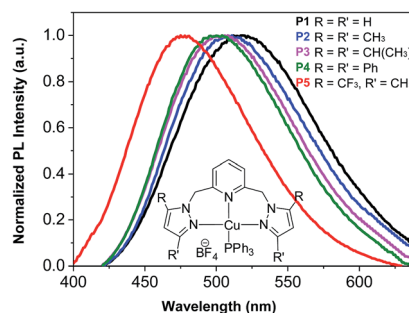


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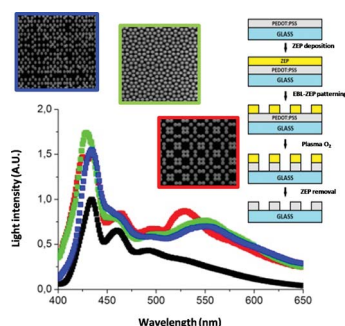
## Phosphorescent Cu(I) complexes based on bis(pyrazol-1-yl-methyl)-pyridine derivatives for organic light-emitting diodes

Fengshou Wu, Jie Li, Hongbo Tong, Zaoying Li,<sup>\*</sup> Chihaya Adachi, Adam Langlois, Pierre D. Harvey, Li Liu, Wai-Yeung Wong,<sup>\*</sup> Wai-Kwok Wong<sup>\*</sup> and Xunjin Zhu<sup>\*</sup>

A new class of Cu(I) complexes based on bis(pyrazol-1-yl-methyl)-pyridine derivatives have been developed as organic electrophosphorescent materials for simple double-layer OLED applications.



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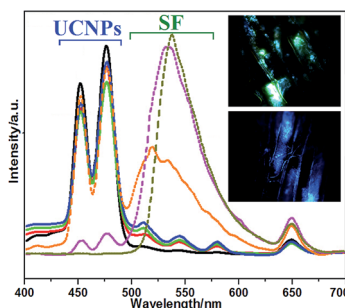


### Nanostructured PEDOT:PSS film with two-dimensional photonic quasi crystals for efficient white OLED devices

Massimo Rippa, Rossella Capasso, Lucia Petti,<sup>\*</sup> Giuseppe Nenna, Anna De Girolamo Del Mauro, Maria Grazia Maglione and Carla Minarini

Polymeric nanostructured highly conductive films with Photonic Quasi Crystal topologies are presented with possibilities to open the path towards highly efficient white OLEDs.

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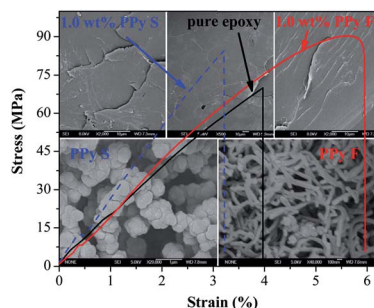


### Multicolor upconversion NaLuF<sub>4</sub> fluorescent nanoprobe for plant cell imaging and detection of sodium fluorescein

Zenghui Chen, Xiaofeng Wu,<sup>\*</sup> Shigang Hu, Pan Hu, Huanyuan Yan, Zhijun Tang and Yunxin Liu<sup>\*</sup>

Detection limit of sodium fluorescein in plant cells can reach  $0.14 \mu\text{g cm}^{-3}$  based on LRET from UCNPs to SF.

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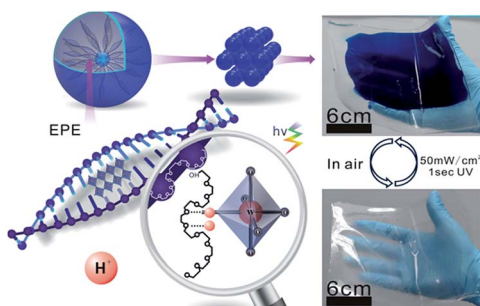


### Polypyrrole doped epoxy resin nanocomposites with enhanced mechanical properties and reduced flammability

Xi Zhang, Xingru Yan, Jiang Guo, Zhen Liu, Dawei Jiang, Qingliang He, Huige Wei, Hongbo Gu, Henry A. Colorado, Xinyu Zhang, Suying Wei<sup>\*</sup> and Zhanhu Guo<sup>\*</sup>

As well as limiting the crack propagation, polypyrrole nanofibers further initiated shear bands in epoxy to give a higher tensile strength than polypyrrole nanospheres.

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### Enhanced photochromic efficiency of transparent and flexible nanocomposite films based on PEO-PPO-PEO and tungstate hybridization

C. Wang, B. P. Zhou, X. P. Zeng, Y. Y. Hong, Y. B. Gao and W. J. Wen<sup>\*</sup>

Enhanced photochromism of hybrid films synthesized by a simple one-pot self-assembly method.

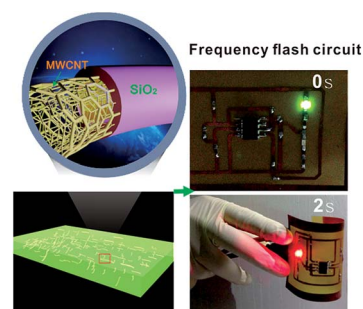


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### Encapsulating carbon nanotubes with SiO<sub>2</sub>: a strategy for applying them in polymer nanocomposites with high mechanical strength and electrical insulation

Xiaoliang Zeng, Shuhui Yu,\* Lei Ye, Mingyang Li, Zhilong Pan, Rong Sun\* and Jianbin Xu

SiO<sub>2</sub> coated multiwalled carbon nanotubes filled polymer nanocomposites with high mechanical strength and electrical insulation were developed and employed to fabricate a printed circuit substrate.

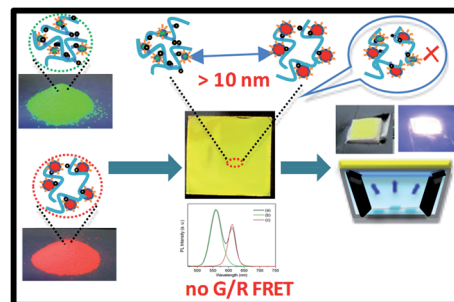


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### Preparation of quantum dot/polymer light conversion films with alleviated Förster resonance energy transfer redshift

Chih-Jung Chen, Chee-Cheng Lin, Jiun-Yi Lien, Sue-Lein Wang and Ray-Kuang Chiang\*

A hybrid QD/polymer light conversion film containing both green- and red-emission QD nanoclusters shows minimized G/R FRET effect.

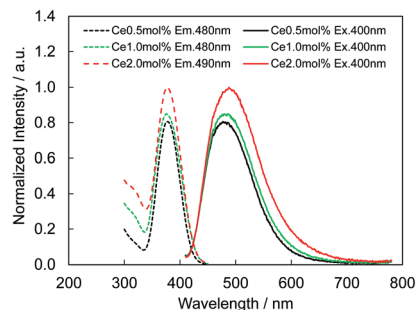


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### Synthesis, structure and optical properties of cerium-doped calcium barium phosphate – a novel blue-green phosphor for solid-state lighting

Naoyuki Komuro,\* Masayoshi Mikami, Yasuo Shimomura, Erica G. Bithell and Anthony K. Cheetham

A new blue-green phosphor, Ca<sub>6</sub>BaP<sub>4</sub>O<sub>17</sub>:Ce<sup>3+</sup>, which can be prepared by conventional solid-state synthesis, is reported as a candidate phosphor for solid-state lighting with near-ultraviolet LEDs.



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### Flexible metal–organic framework-based one-dimensional photonic crystals

Zhihong Hu, Cheng-an Tao, Fang Wang, Xiaorong Zou and Jianfang Wang\*

Flexible metal–organic framework-based, one-dimensional photonic crystals, which can selectively respond to various vapors due to the “breathing effect”, were fabricated.

