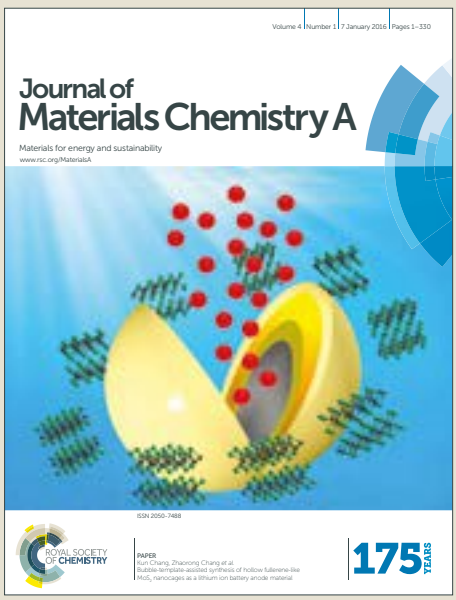
Journal of Materials Chemistry A

Accepted Manuscript

This article can be cited before page numbers have been issued, to do this please use: Y. Zhang, Q. Shen, J. Hou, P. D. Sutrisna and V. Chen, *J. Mater. Chem. A*, 2017, DOI: 10.1039/C6TA10395B.



ROYAL SOCIETY OF CHEMISTRY

rsc.li/materials-a

View Article Online
DOI: 10.1039/C6TA10395B

Journal of Materials Chemistry A

Communication

Shear-aligned Graphene Oxide Laminate/Pebax Ultrathin Composite Hollow Fiber Membranes Using a Facile Dip-coating Approach

Received 00th January 20xx,
Accepted 00th January 20xx

DOI: 10.1039/x0xx00000x

www.rsc.org/

Yatao Zhang[a,b], Qin Shen[a], Jingwei Hou[*b], Putu Doddy Sutrisna[b] and Vicki Chen[**b]

Graphene oxide (GO) has been considered as a promising candidate for molecular separation because of its capability to form highly efficient gas flow intergalleries. However, a major challenge is the lack of a facile, scalable, low-cost membrane fabrication approach, especially for the hollow fiber composite membrane with a thin selective layer. By using a facile dip-coating technique, we prepared a shear-aligned GO/Pebax composite hollow fiber membrane on a porous polymeric support. The incorporation of the aligned GO laminates significantly improved the original Pebax (polyethylene oxide – polyamide block copolymer) membrane permeance without compromising the CO_2/N_2 selectivity, and the composite membrane had good operational stability and enhanced mechanical strength. We further investigate the formation mechanism of the shear-aligned GO structure and discovered the control of the withdraw speed and liquid film thickness was a key factor. This dip-coating technique offers significant opportunities to exploit the GO-based membrane for industrial CO_2 capture.

Introduction

Graphene oxide (GO) is a two-dimensional material with distinct structural, chemical and electrical properties. It offers a wide-ranging opportunity for developing a new family of molecular separation membranes.[1] The separation mechanisms of GO-based membranes arise from 1) pores on GO sheets; 2) in-plane slit-like pores; and 3) intergalleries between GO sheets. Precise control of the perforation and slit-like pores still remains a technical challenge. Therefore, most researchers apply physical or chemical approaches to regulating the intergalleries for the separation of small molecules.[2] Currently, the preparation of pure GO membranes is mostly based on the deposition of GO onto porous supports with external forces (e.g. pressure, centrifugal or capillary forces).[3, 4] However, it has been challenging to precisely tune the laminate arrangements especially over large surface areas. This leads to random plane-to-plane stacking and non-selective defects. Recently, a centrifugation-filtration synergetic approach was applied to precisely manipulate the GO intergallery channels. The resultant GO membrane had highly ordered laminate structure for ultrafast gas sieving.[2] However, this fabrication approach requires simultaneous manipulation of spin coating and filtration, and thus making the scale-up difficult. In another approach, the GO suspension was firstly concentrated to a discotic nematic phase, then casting-aligned to form an anisotropic membrane.[5, 6] However, for the pure GO membranes, there are still concerns about their structural stability, especially in an aqueous environment. For example, the water-induced swelling effect can change the densely-packed GO laminate structures and subsequently compromise the molecular sieving capabilities. As a result, it is preferable to fabricate GO/polymeric mixed matrix membranes.

Polymeric membranes currently dominate the gas separation market due to the ease of processing and low cost.[7-9] So far, only a few successful attempts have been reported to blend GO into a polymer matrix for efficient gas separation membrane fabrication. Shen et al.[10] utilized the favorable molecular interactions between GO and polymer to assemble GO into well-defined GO laminates within flat sheet membrane matrix. The molecular sieving interlayer spacing and straight diffusion pathways facilitated the efficient gas transport through the membrane. In another line of research, Berean et al. [11] blended GO into polydimethylsiloxane (PDMS) membrane matrix. Due to the relatively weak interaction between GO and polymer, the interfacial voids provided fast gas transport channels. However, most existing GO/polymer mixed matrix gas separation membranes are relatively thick flat sheet membranes (>50 μm). The formation of thin (~1 μm), continuous GO/polymer film on hollow fiber support is preferable to promote the practical gas permeance for practical application. Considering the dimension of GO sheets can be tens of microns, the randomly oriented GO nanosheets within the thin polymeric film are prone to create non-selective defects and compromise the gas separation efficiency. At

[a] School of Chemical Engineering and Energy, Zhengzhou University, Kexue Road 100, Zhengzhou 450001 (P.R. China).
[b] UNESCO Centre for Membrane Science and Technology, University of New South Wales, Sydney, NSW, 2052 (Australia)
Email: Jingwei.hou@unsw.edu.au; v.chen@unsw.edu.au

† Footnotes relating to the title and/or authors should appear here.
Electronic Supplementary Information (ESI) available: [details of any supplementary information available should be included here]. See DOI: 10.1039/x0xx00000x

View Article Online
DOI: 10.1039/C6TA10395B

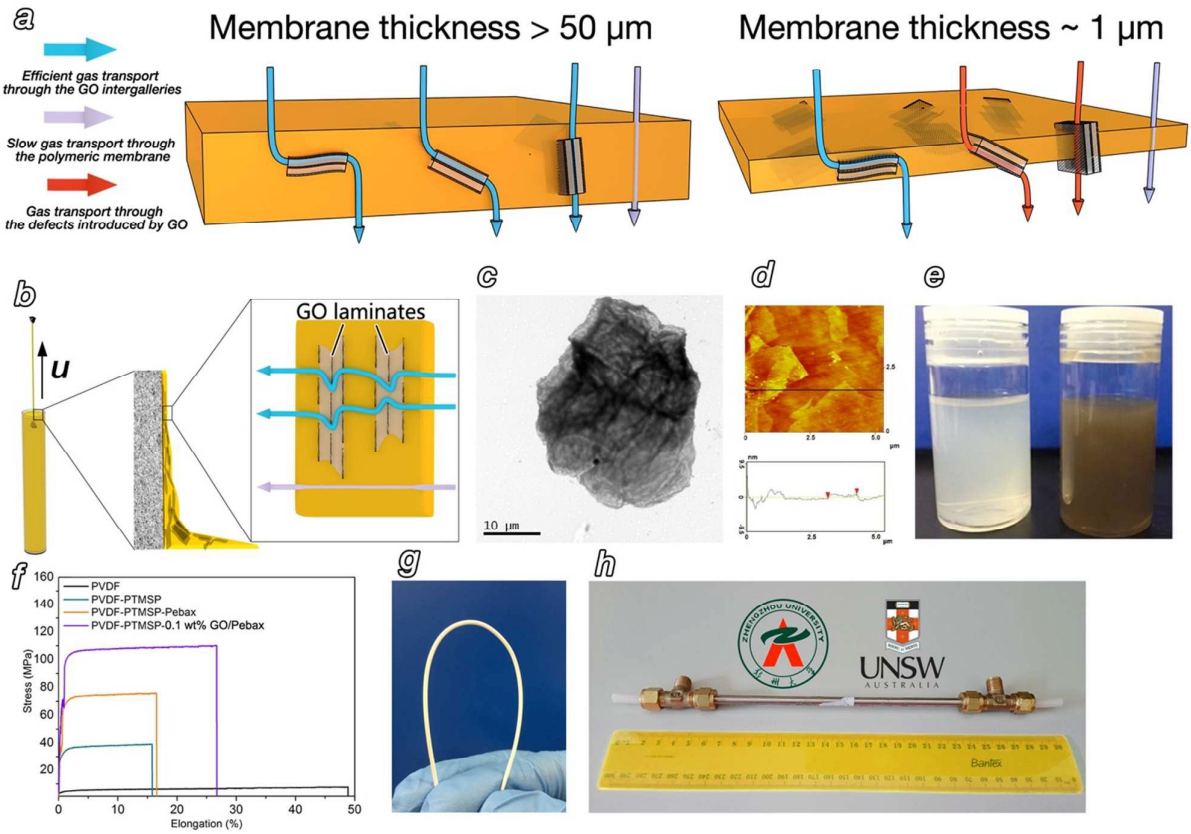


Figure 1. Preparation of GO/polymer membrane for gas separation. a) Schematic representation of the thick and thin mixed matrix membrane. b) Formation of the thin selective layer via the dip-coating process. c,d) TEM and AFM of the GO nanosheets. e) Optical image of the Pebax solution (left) and the GO/Pebax solution (right). f) Tensile testing of the membrane. g,h) Optical image of the prepared membrane and membrane module.

the same time, it is still challenging to control the orientation of GO laminates within the thin GO/polymer layer (Figure 1a).

Dip coating is a facile approach to introducing a composite membrane with a thin selective layer. It allows easier control and scale-up, and can be integrated with the existing membrane fabrication apparatus for industrial production.[12, 13] We have previously prepared a composite hollow fiber gas separation membrane via the dip-coating technique.[14] A thin, continuous Pebax-1657 (Figure S1) selective layer was deposited onto polyvinylidene fluoride (PVDF) membrane surface. We postulated that the surface tension, capillary effect, and gravity during the dip-coating process would facilitate the GO sheets alignment within the thin selective layer (Figure 1b). Hence, we explored the formation of a thin GO/Pebax composite layer on a hollow-fiber PVDF membrane with a pore size of 0.05 μm.

Results and discussion

GO nanosheets in this work were prepared via the modified Hummers' method.[15] This approach generates an oxidized graphite material that can be sonicated to form a well-dispersed stable aqueous GO suspension. The presence of hydroxyl, carboxyl, carbonyl groups on GO is confirmed by the FT-IR results (Figure S2). The feature diffraction peak of GO appears at 10.4°, indicating the increase of interlayer distance to 0.85 nm compared with the graphite (2θ=26.6°, d-spacing 0.34 nm). This can be attributed to the presence of functional groups, especially the carboxyl groups with intrinsic repulsive electrostatic forces (Figure S3).[2, 16] The in-house prepared GO has a dimension of ca. 1-2 μm up to 20-30 μm with a thickness of ca. 1-1.2 nm (Figure 1 c-d) and is in good agreement with previous studies.[2, 15] Seeking to understand the effect of GO concentration, 0.05, 0.1 and 0.2 wt % of GO were dispersed into 3 wt % Pebax solution (solvent: water/ethanol=30/70). The resultant suspension solutions are homogeneous based on visual observation, and they are stable at room temperature due to the formation of hydrogen bonds between GO and Pebax (Figure 1e),[10] and the stable suspension facilitates the formation of an even coating layer on the supporting membrane surface. The virgin PVDF and coated PVDF membranes show elastic behavior at a low elongation rate, and the incorporation of GO shows a striking improvement of Young's modulus for the composite membrane, which originated from both the mechanical strength of GO and the good interfacial compatibility between GO and Pebax polymers (Figure 1f). This result also indicates the composite membrane has good flexibility and enhanced mechanical properties (Figure 1g-h). Such a property

View Article Online
DOI: 10.1039/C6TA10395B

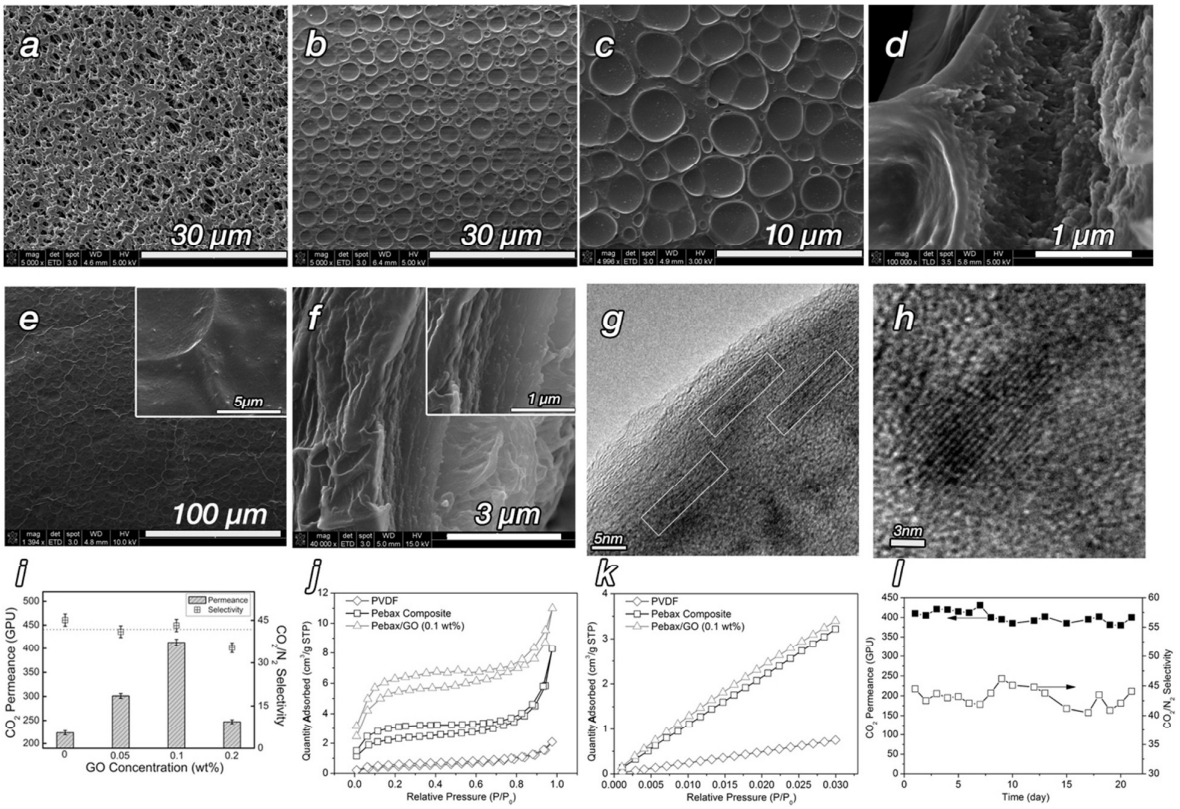


Figure 2 Performance of the GO/Pebax hollow fiber membrane. SEM images of a) original PVDF membrane, b) PTMSP coated membrane, c) pure Pebax coated membrane, d) cross-section of pure Pebax coated membrane, e) GO/Pebax coated membrane, f) cross-section of GO/Pebax coated membrane (insert: enlarged image). g,h) cross-section TEM images of the GO/Pebax membrane (with highlighted GO). i) Membrane performance with different GO concentration. j,k) N_2 and CO_2 adsorption isotherms. l) Long-term performance of the membrane.

is preferable for large-scale manufacture of the composite membrane.

In order to avoid the penetration of coating layer into the pores, the PVDF membrane was initially coated with poly[1-(trimethylsilyl)-1-propyne] (PTMSP, Figure S1) as a highly permeable gutter layer. After the PTMSP coating, the membrane surface is smoother yet still has some micron-scale shallow pits possibly due to the condensation of water vapour during the drying process (Figure 2a-c). The thickness of the PTMSP gutter layer is approximately 5 μm (Figure S4). Further two cycles of Pebax coating increased the thickness by around 1 μm, suggesting the thickness of the Pebax (or GO/Pebax) selective layer is in the order of 1 μm. However, it should be noted that it is difficult to accurately determine the thickness of Pebax layer due to the absence of a clear PTMSP/Pebax interface (the selective layer and the gutter layer are interfused together) (Figure S4). It can be attributed to the re-dissolution of PTMSP during the Pebax coating process (water/ethanol solvent). Such an observation is in agreement with other dip-coated multi-layer composite membranes that the exact thickness of the selective layer is difficult to characterize.[17, 18] In this work, we also attempt to investigate the effect of GO content on the selective layer thickness and the results suggest membranes with different GO content have similar overall thickness (±0.2 micron), as the GO concentrations applied in this work is relatively low (up to 0.2 wt %).

After the addition of GO/Pebax coating, the membrane surface is still largely smooth, with only a few minor wrinkles (Figure 2e) indicating that GO laminates are mostly parallel to the membrane surface. This shear aligned multi-layer GO laminates are confirmed by the cross-sectional SEM and TEM images (Figure 2f-h). Due to the confinement effects of the Pebax chains and the hydrogen bonding with surrounding polymers, GO nanosheets form stacked laminates with d-space of ~0.7 nm (intergallery distance of ~0.35 nm considering the thickness of GO, in between the molecular kinetic diameters of CO_2 (0.33 nm) and N_2 (0.36 nm)). It should be noted that the d-space is determined from the TEM images as the GO peak in the composite membrane XRD result is too weak to be determined. The intergallery distance is calculated by deducting the GO laminate thickness from the d-space value. Such structure is in line with previous research and beneficial for size exclusion gas separation.[19, 20]

Figure 2i shows the incorporation of GO within Pebax significantly improves the CO_2 permeance (up to 90 %) without losing the selectivity. However, further increase of the GO concentration (to 0.2 wt%) leads to the decrease of both permeance and selectivity. When the GO content is relatively high in the coating solution, the non-permeable 2D layers can disrupt the solvent evaporation and subsequently perturb the alignment of GO, which results in

View Article Online
DOI: 10.1039/C6TA10395B

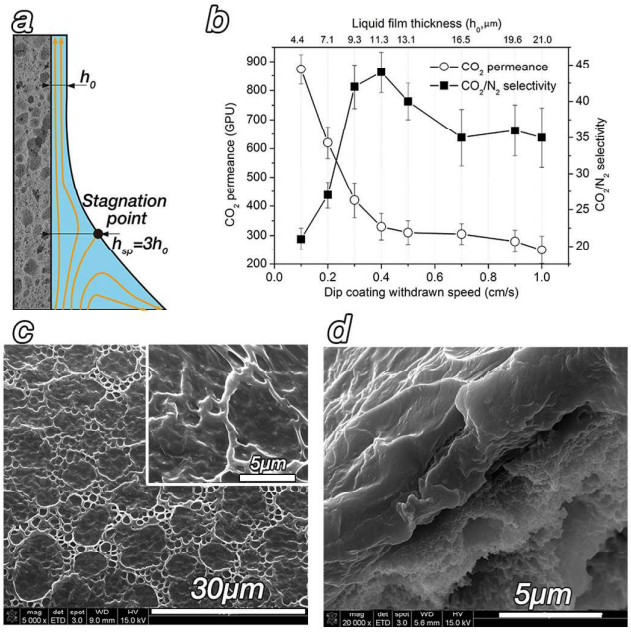


Figure 3. Formation of the parallel-aligned GO laminates. a) Schematic diagram of the liquid film and meniscus. b) Membrane performance with different withdrawn speed (0.1 wt% GO). c,d) SEM image of the membrane prepared with 1cm/s withdrawn speed

more tortuous gas transport pathway and defects within the thin GO/polymer layer. The gas permeation through the membrane is determined by its solubility and diffusivity and both highly selective chemical affinities and molecular sieving effects are preferable for fast and selective gas separation.[21, 22] We then conducted gas adsorption test to further explore the function of GO in gas separation. The incorporation of GO improves the nitrogen adsorption for the composite membrane due to the large surface area of GO. But it only marginally increases the CO_2 uptake. Due the presence of functional groups such as –COOH and -OH on GO surface, it usually exhibits preferential adsorption of polar gasses such as CO_2.[3, 23, 24] However, the formation of hydrogen bonds between GO and Pebax limits the preferential adsorption of CO_2 onto the GO laminates.[25, 26] In addition, it can also rigidify the Pebax polymeric chains and reduce the gas permeability. This observation suggests the improvement in CO_2 permeation did not originate from the solution/diffusion mechanism for the Pebax/GO membrane. Instead, considering the intergallery distance of ~0.35 nm for the GO laminates which is larger than CO_2 kinetic diameter (0.33 nm), we postulated that by introducing size-selective channels the parallel-aligned GO laminates create highly efficient gas transport channels without leading to extra defects within the thin composite layer. The presence of the GO laminates would provide more rapid pathways compared to the relatively slower diffusion through the bulk Pebax polymer.[24, 27-30] All these aspects lead to the improved membrane performance after the incorporation of GO even the gas transport pathways are more tortuous. We further examined the long-term operational stability of the composite membrane and the result suggests good stability for the membrane (Figure 2l). The aging of PTMSP can lead to the loss of permeance overtime.[31] However, no clear loss of permeance is observed in this work. The GO/Pebax layer partially fused within the PTMSP gutter layer, suggesting the intertwining of their polymer chains, which stabilize the non-equilibrium PTMSP structure. On the other hand, we also conducted the dip-coating of pure GO (0.1 wt% in ethanol/water solvent) onto the PTMSP pre-coated membrane, and the gas permeation results shows it has negligible change before and after the pure GO coating (CO_2 3,570 GPU and CO_2/N_2 selectivity of 4.5 for PTMSP gutter layer coated membrane vs. CO_2 3,250 GPU and CO_2/N_2 selectivity of 4.6 for GO/PTMSP coated membrane), indicating the GO coating layer is not continuous. This observation can be attributed to the weak affinity of GO to PTMSP, which leads to GO detachment during the repeated coating process.

The shear-induced alignment of nanowires, carbon nanotubes and stripes on substrate surface has been reported previously.[32-34] But this has not been demonstrated with the multi-layer GO laminates for molecular sieving. During the dip coating process, the viscous forces near the surface entrain the adjacent fluid upward. The entrainment effect forms a meniscus and the material above the stagnant point are carried into the liquid film on the substrate surface (Figure 3a). The thickness of the liquid layer is defined by the withdrawn speed, liquid viscosity, and surface tension. The capillary number Ca_0 in this work was lower than 1 (within the Newtonian regime, Section 2.3 in Supporting information), thus the liquid film thickness can be calculated by the Landau-Levich equation.[35] The liquid film thickness with 0.1 wt % GO solution and 0.3 cm/s withdrawn speed is ~9 μm (Figure S5), which is comparable to the lateral GO dimensions in this work. As a result, the meniscus acts to align the GO laminates during the dip-coating process, mainly via the strong deposition force from receding meniscus by gravity. In order to confirm this speculation, we further prepared a series of membranes with different withdraw speeds. Figure 3b depicts that for the membrane containing 0.1 wt % GO, with the increase of withdrawn speed, the CO_2 permeance decreases, which can be explained by the thicker liquid film and eventually thicker selective layer. However, at low withdraw speed (<0.3 cm/s) the very thin coating may introduce some defects. On the other hand, high withdraw speed also leads to the loss of selectivity. As shown in the SEM images, the GO laminates lose the parallel structure under high withdrawn speeds (Figure 3c-d). This corrugated surface structure can introduce extra defects between randomly orientated GO laminates. The higher withdraw speed increased the liquid film thickness. In this work, the speed of 1.0 cm/s results in a liquid film of ~22 μm, which is comparable to or higher than the average GO dimension, allowing the random orientation of GO sheets within the liquid layer. On the other hand, thicker liquid requires a longer time for solvent evaporation. The constant convection force towards the liquid surface during the prolonged evaporation process has been discovered to lead to the heterogeneous GO structures.[36] We also investigated the effect of dip-coating withdrawn speed for membrane containing a relatively high content of GO (0.2 wt %). The result (Figure S6) depicts the aggregation of GO can disrupt the densely packed GO structure and degrade the gas separation performance, suggesting the concentration of GO plays an important role in forming the alignment structure.

View Article Online
DOI: 10.1039/C6TA10395B

The performances of composite hollow fiber membranes are summarized in Table 1. Normally, lower membrane selectivity is anticipated with the ultrathin composite membranes compared with homogeneous dense membranes.[37] Compared with the literature values, the composite membranes containing aligned GO have the highest CO_2/N_2 selectivity due to the alignment of GO interlayer galleries, as well as the good compatibility between GO nanosheets and the polymeric matrix. Even though the PDMS/PAN composite membranes exhibited a much higher CO_2 permance but the selectivity was significantly lower than the composite membrane in this work.[38] The GO/Pebax composite membrane also outperformed our previous work of ZIF-8/Pebax-based composite membranes, where the incorporation of ZIF-8 nanoparticles into the thin Pebax selective layer creates extra defects.[37]

Table 1 Comparison of hollow fiber composite membranes for CO_2/N_2 separation

Membrane type	Testing T/P (°C/MPa)	Permeance (GPU)		Selectivity	Ref.
		N_2	CO_2	CO_2/N_2	
Matrimid/PES	25/0.39	0.76	60	39	[39]
PIM-1/Matrimid	25/0.1	9.2	235	25.5	[40]
6FDA-DAM-DABA	30/0.23	21.7	520	24	[41]
Pebax /PSf	25/0.2	2	61	30	[42]
PDMS/PAN	25/0.2	112	1211	10.8	[38]
Pebax/ZIF-8/PVDF	25/0.2	10.9	345	31.7	[37]
Pebax/GO/PVDF	25/0.2	9.6	413.3	43.2	This work

Conclusions

In conclusion, we report here that shear-aligned GO laminates can be achieved within a thin polymer layer by a facile dip coating process. Control of liquid film thickness appears crucial to achieving alignment of GO laminates within the coating. The incorporated GO laminates provide highly efficient gas transport pathway without introducing extra defects to the thin layer. In general, this technique provides a feasible pathway for large-scale production of GO-polymer composite membrane for industrial CO_2 separation, and potentially offers an opportunity to exploit the unique properties of regulating the structure of other similar 2D materials within a thin composite layer to realize their unique properties in separation, sensing and catalysis.

Acknowledgements

This work was financially sponsored by the National Natural Science Foundation of China (No. 21376225), Program for Science & Technology Innovation Talents in Universities of Henan Province (16HASTIT004), and Excellent Youth Development Foundation of Zhengzhou University (No. 1421324066). We also acknowledge the financial assistance of visiting research program by China Scholarship Council (Yatao Zhang, No. 201208410135) and Australia Awards Scholarship (Putu Doddy Sutrisna).

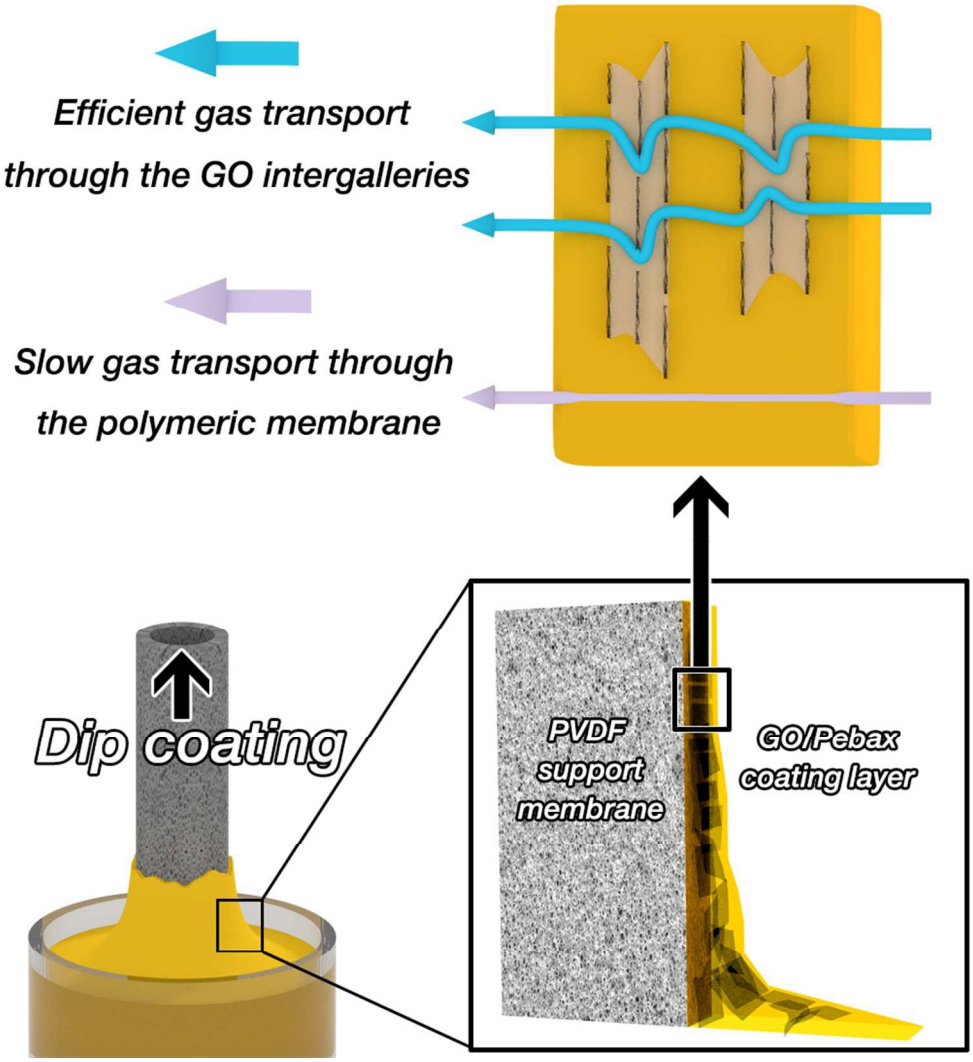
Notes and references

1. Z. P. Smith and B. D. Freeman, *Angew Chem Int Ed Engl*, 2014, **53**, 10286-10288.
2. J. Shen, G. Liu, K. Huang, Z. Chu, W. Jin and N. Xu, *ACS Nano*, 2016, **10**, 3398-3409.
3. H. Li, Z. Song, X. Zhang, Y. Huang, S. Li, Y. Mao, H. J. Ploehn, Y. Bao and M. Yu, *Science*, 2013, **342**, 95-98.
4. H. W. Kim, H. W. Yoon, S.-M. Yoon, B. M. Yoo, B. K. Ahn, Y. H. Cho, H. J. Shin, H. Yang, U. Paik and S. Kwon, *Science*, 2013, **342**, 91-95.
5. A. Akbari, P. Sheath, S. T. Martin, D. B. Shinde, M. Shaibani, P. C. Banerjee, R. Tkacz, D. Bhattacharyya and M. Majumder, *Nature communications*, 2016, **7**.
6. M. Shaibani, A. Akbari, P. Sheath, C. D. Easton, P. C. Banerjee, K. Konstas, A. Fakhfouri, M. Barghamadi, M. M. Musameh, A. S. Best, T. Rüther, P. J. Mahon, M. R. Hill, A. F. Hollenkamp and M. Majumder, *ACS Nano*, 2016, DOI: 10.1021/acsnano.6b03285.
7. T. C. Merkel, H. Lin, X. Wei and R. Baker, *Journal of Membrane Science*, 2010, **359**, 126-139.
8. A. Car, C. Stropnik, W. Yave and K.-V. Peinemann, *Advanced Functional Materials*, 2008, **18**, 2815-2823.
9. A. J. Brown, N. A. Brunelli, K. Eum, F. Rashidi, J. R. Johnson, W. J. Koros, C. W. Jones and S. Nair, *Science*, 2014, **345**, 72-75.
10. J. Shen, G. Liu, K. Huang, W. Jin, K. R. Lee and N. Xu, *Angew Chem Int Ed Engl*, 2015, **54**, 578-582.
11. K. J. Berean, J. Z. Ou, M. Nour, M. R. Field, M. M. Y. A. Alsaif, Y. Wang, R. Ramanathan, V. Bansal, S. Kentish, C. M. Doherty, A. J. Hill, C. McSweeney, R. B. Kaner and K. Kalantar-zadeh, *The Journal of Physical Chemistry C*, 2015, **119**, 13700-13712.
12. B. Faure, G. Salazar-Alvarez, A. Ahniyaz, I. Villaluenga, G. Berriozabal, Y. R. De Miguel and L. Bergström, *Science and Technology of Advanced Materials*, 2013, **14**, 023001.
13. J. J. Richardson, M. Bjornmalm and F. Caruso, *Science*, 2015, **348**, aaa2491.
14. Y. Wang, T. Hu, H. Li, G. Dong, W. Wong and V. Chen, *Energy Procedia*, 2014, **63**, 202-209.
15. D. C. Marcano, D. V. Kosynkin, J. M. Berlin, A. Sinitskii, Z. Sun, A. Slesarev, L. B. Alemany, W. Lu and J. M. Tour, *ACS nano*, 2010, **4**, 4806-4814.
16. A. Buchsteiner, A. Lerf and J. Pieper, *The Journal of Physical Chemistry B*, 2006, **110**, 22328-22338.
17. J. Kim, Q. Fu, J. M. P. Scofield, S. E. Kentish and G. G. Qiao, *Nanoscale*, 2016, **8**, 8312-8323.
18. J. Kim, Q. Fu, K. Xie, J. M. P. Scofield, S. E. Kentish and G. G. Qiao, *Journal of Membrane Science*, 2016, **515**, 54-62.
19. J. Shen, G. Liu, K. Huang, W. Jin, K.-R. Lee and N. Xu, *Angewandte Chemie International Edition*, 2015, **54**, 578-582.
20. W. Chen and L. Yan, *Advanced Materials*, 2012, **24**, 6229-6233.
21. D. L. Gin and R. D. Noble, *Science*, 2011, **332**, 674-676.
22. J. Hou, P. D. Sutrisna, Y. Zhang and V. Chen, *Angewandte Chemie International Edition*, 2016, **55**, 3947-3951.
23. P. Sun, K. Wang and H. Zhu, *Advanced Materials*, 2016, DOI: 10.1002/adma.201502595, n/a-n/a.
24. G. Liu, W. Jin and N. Xu, *Chemical Society Reviews*, 2015, **44**, 5016-5030.
25. R. K. Layek, A. K. Das, M. J. Park, N. H. Kim and J. H. Lee, *Carbon*, 2015, **81**, 329-338.
26. H. Kim, Y. Miura and C. W. Macosko, *Chemistry of Materials*, 2010, **22**, 3441-3450.
27. L. Yu, Y. Zhang, B. Zhang, J. Liu, H. Zhang and C. Song, *Journal of Membrane Science*, 2013, **447**, 452-462.
28. Y. H. Yang, L. Bolling, M. A. Priolo and J. C. Grunlan, *Advanced Materials*, 2013, **25**, 503-508.
29. J. Du and H. M. Cheng, *Macromolecular Chemistry and Physics*, 2012, **213**, 1060-1077.
30. M. Rezakazemi, A. E. Amooghin, M. M. Montazer-Rahmati, A. F. Ismail and T. Matsuura, *Progress in Polymer Science*, 2014, **39**, 817-861.
31. G. Consolati, I. Genco, M. Pegoraro and L. Zanderighi, *Journal of Polymer Science Part B: Polymer Physics*, 1996, **34**, 357-367.
32. M. Li, C. An, W. Pisula and K. Müllen, *Small*, 2014, **10**, 1926-1931.
33. J. Huang, R. Fan, S. Connor and P. Yang, *Angewandte Chemie*, 2007, **119**, 2466-2469.
34. S. Park, G. Pitner, G. Giri, J. H. Koo, J. Park, K. Kim, H. Wang, R. Sinclair, H. S. P. Wong and Z. Bao, *Advanced Materials*, 2015, **27**, 2656-2662.

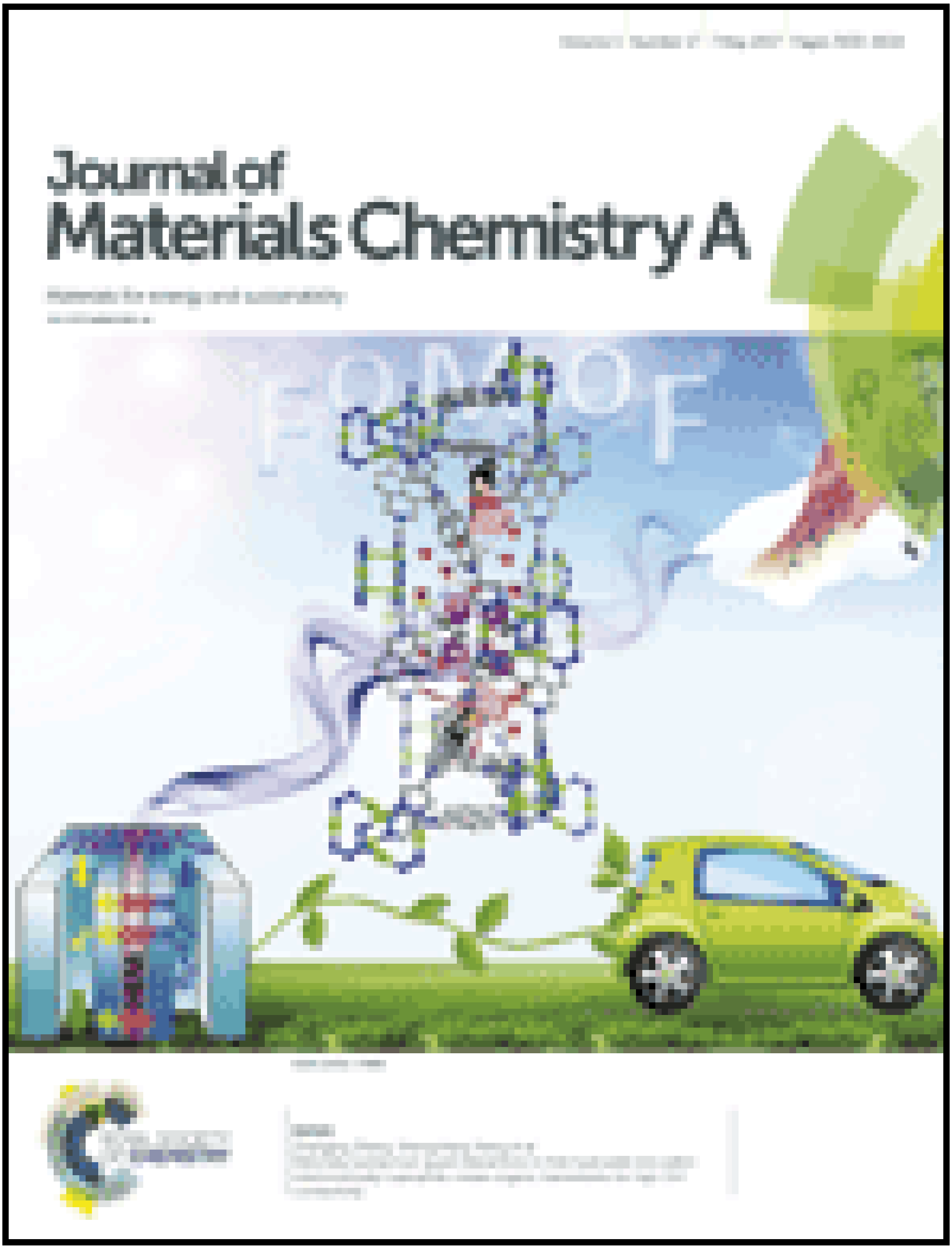
View Article Online
DOI: 10.1039/C6TA10395B

35. M. Maleki, M. Reyssat, F. Restagno, D. Quéré and C. Clanet, *Journal of Colloid and Interface Science*, 2011, **354**, 359-363.
36. C.-H. Tsou, Q.-F. An, S.-C. Lo, M. De Guzman, W.-S. Hung, C.-C. Hu, K.-R. Lee and J.-Y. Lai, *Journal of Membrane Science*, 2015, **477**, 93-100.
37. P. D. Sutrisna, J. Hou, H. Li, Y. Zhang and V. Chen, *Journal of Membrane Science*, DOI: http://dx.doi.org/10.1016/j.memsci.2016.11.048.
38. P. Li, H. Z. Chen and T.-S. Chung, *Journal of Membrane Science*, 2013, **434**, 18-25.
39. G. C. Kapantaidakis and G. H. Koops, *Journal of Membrane Science*, 2002, **204**, 153-171.
40. W. F. Yong, F. Y. Li, Y. C. Xiao, T. S. Chung and Y. W. Tong, *Journal of Membrane Science*, 2013, **443**, 156-169.
41. R. P. Lively, M. E. Dose, L. Xu, J. T. Vaughn, J. R. Johnson, J. A. Thompson, K. Zhang, M. E. Lydon, J.-S. Lee, L. Liu, Z. Hu, O. Karvan, M. J. Realff and W. J. Koros, *Journal of Membrane Science*, 2012, **423–424**, 302-313.
42. L. Liu, A. Chakma and X. Feng, *Chemical Engineering Journal*, 2004, **105**, 43-51.

View Article Online
DOI: 10.1039/C6TA10395B



364x389mm (72 x 72 DPI)


Journal of
Materials Chemistry A

Editorial board

Editorial board | Advisory board | Editorial office | Lectureship

Editor-in-chief

Associate editors

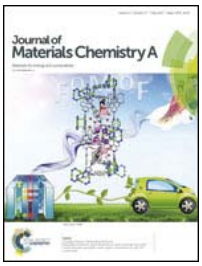
Log in / register

Journal of Materials Chemistry A

View all journals

Recent | Issues | Collections

Previous | Latest | Next



Journal of Materials Chemistry A

07 May 2017, Issue 17,
Page 7633 to 8134

60 items

Cover info and contents

Review Article

Rechargeable zinc–air batteries: a promising way to green energy

Peng Gu, Mingbo Zheng, Qunxing Zhao, Xiao Xiao, Huaiguo Xue and Huan Pang

Rechargeable zinc–air batteries show great potential in applications such as electric vehicles and wearable devices, especially for the flexible design. And the challenges and functional materials for each component are provided and discussed from air electrode, solid-state electrolyte to zinc anode, with perspectives of research directions.

Top | Info | Search

From the themed collection: Recent Review Articles

The article was first published on 21 Mar 2017
J. Mater. Chem. A, 2017, **5**, 7651-7666
https://doi.org/10.1039/C7TA01693J

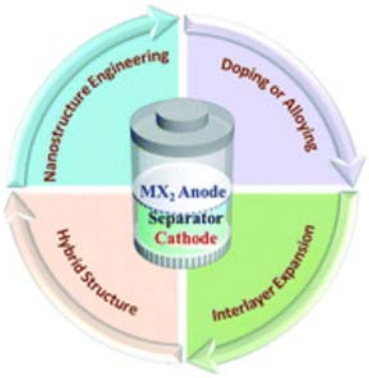
Download PDF Article HTML

Review Article

Recent progress in layered metal dichalcogenide nanostructures as electrodes for high-performance sodium-ion batteries

Wenpei Kang, Yuyu Wang and Jun Xu

The sodium storage performance of layered metal dichalcogenide anodes enhanced through nanostructure engineering, crystal structure modulation, doping/alloying and composite design is systematically reviewed.



From the themed collection: Recent Review Articles

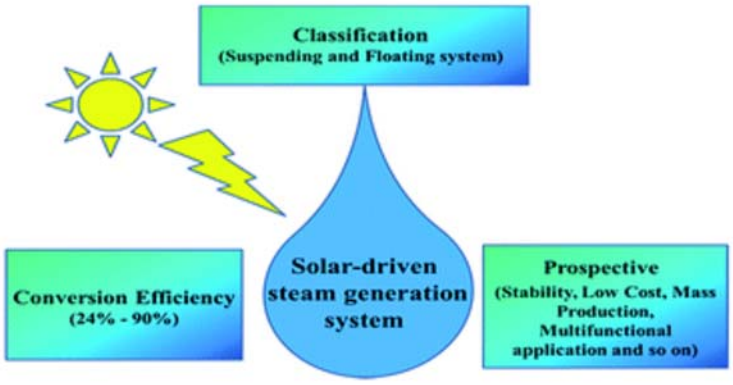
Download PDF Article HTML

Review Article

The emergence of solar thermal utilization: solar-driven steam generation

Ziyang Deng, Jianhua Zhou, Lei Miao, Chengyan Liu, Ying Peng, Lixian Sun and Sakae Tanemura

This work mainly reviewed the classification, development, influencing factors and future prospects of solar-driven steam generation systems.



From the themed collection: Recent Review Articles

The article was first published on 25 Mar 2017
J. Mater. Chem. A, 2017, **5**, 7691-7709
https://doi.org/10.1039/C7TA01361B

Download PDF Article HTML

Review Article

In pursuit of catalytic cathodes for lithium–oxygen batteries

Ali Eftekhari and Balaji Ramanujam

Li–O_2 batteries are among the most promising electrochemical energy storage systems, which have attracted significant attention over the past five years due to their potential to satisfy new demands such as powering electric vehicles.

From the themed collection: Recent Review Articles

The article was first published on 25 Mar 2017
J. Mater. Chem. A, 2017, **5**, 7710-7731
https://doi.org/10.1039/C7TA01124E

Download PDF Article HTML

Communication

Shear-aligned graphene oxide laminate/Pebax ultrathin composite hollow fiber membranes using a facile dip-coating approach

Yatao Zhang, Qin Shen, Jingwei Hou, Putu Doddy Sutrisna and Vicki Chen

Graphene oxide (GO) has been considered as a promising candidate for molecular separation because of its capability to form highly efficient gas flow intergalleries within an ultrathin composite membrane.

The article was first published on 01 Mar 2017
J. Mater. Chem. A, 2017, **5**, 7732-7737
https://doi.org/10.1039/C6TA10395B

Download PDF Article HTML

Communication

A new Na[(FSO_2)(*n*-$C_4F_9SO_2$)N]-based polymer electrolyte for solid-state sodium batteries

Qiang Ma, Juanjuan Liu, Xingguo Qi, Xiaohui Rong, Yuanjun Shao, Wenfang Feng, Jin Nie, Yong-Sheng Hu, Hong Li, Xuejie Huang, Liquan Chen and Zhibin Zhou

The NaFNFSI-based SPE can deliver the excellent interfacial stability with Na metal and good cycling performances for the Na|SPE|$NaCu_{1/9}Ni_{2/9}Fe_{1/3}Mn_{1/3}O_2$ cell.

J. Mater. Chem. A, 2017, **5**, 7738-7743
https://doi.org/10.1039/C7TA01820G

Download PDF Article HTML

Communication

Experimental and theoretical insights into sustained water splitting with an electrodeposited nanoporous nickel hydroxide@nickel film as an electrocatalyst

Zhicai Xing, Linfeng Gan, Jin Wang and Xiurong Yang

Electrodeposited nanoporous $Ni(OH)_2$@Ni film acts as a Janus electrocatalyst for the hydrogen evolution and oxygen evolution reaction, and overall water splitting, exhibiting superior activities and exceptional long-term stability. Theoretical calculations show that the synergistic electrocatalytic effects of $Ni(OH)_2$ and Ni are responsible for the high activities.

The article was first published on 29 Mar 2017
J. Mater. Chem. A, 2017, **5**, 7744-7748
https://doi.org/10.1039/C7TA01907F

Download PDF Article HTML

Communication

Potassium-chemical synthesis of 3D graphene from CO_2 and its excellent performance in HTM-free perovskite solar cells

Wei Wei, Baoyun Hu, Fangming Jin, Zhenzi Jing, Yuexiang Li, Andres Alberto García Blanco, Dario J. Stacchiola and Yun Hang Hu

The conversion of greenhouse gas CO_2 into novel materials is the most promising approach to solve greenhouse gas issues.

Download PDF Article HTML

Communication

Atomic-scale topochemical preparation of crystalline Fe^{3+}-doped β-$Ni(OH)_2$ for an ultrahigh-rate oxygen evolution reaction

Kaiyue Zhu, Huanying Liu, Mingrun Li, Xuning Li, Junhu Wang, Xuefeng Zhu and Weishen Yang

Fe^{3+}-doped β-$Ni(OH)_2$, prepared *via* an atomic-scale topochemical transformation route, exhibits much higher oxygen evolution activity than the state-of-the-art IrO_2.

The article was first published on 28 Mar 2017
J. Mater. Chem. A, 2017, **5**, 7753-7758
https://doi.org/10.1039/C7TA01408B

Download PDF Article HTML

Communication

Microwave-synthesized tin oxide nanocrystals for low-temperature solution-processed planar junction organo-halide perovskite solar cells

Mutalifu Abulikemu, Marios Neophytou, Jérémy M. Barbé, Max L. Tietze, Abdulrahman El Labban, Dalaver H. Anjum, Aram Amassian, Iain McCulloch and Silvano Del Gobbo

Tin oxide nanoparticles prepared by microwave-assisted non-aqueous sol–gel were used to cast an electron transporting layer for organohalide perovskite solar cells showing, in average, high efficiencies thanks to the good optoelectronic properties of the material.

The article was first published on 25 Mar 2017
J. Mater. Chem. A, 2017, **5**, 7759-7763
https://doi.org/10.1039/C7TA00975E

Download PDF Article HTML

Communication

Nano-structured hybrid molybdenum carbides/nitrides generated *in situ* for HER applications

Rajinder Kumar, Ritu Rai, Seema Gautam, Abir De Sarkar, Nidhi Tiwari, Shambhu Nath Jha, Dibyendu Bhattacharyya, Ashok K. Ganguli and Vivek Bagchi

A highly efficient, low-cost (precious-metal-free), highly stable nanohybrid electrocatalyst containing carbon-supported molybdenum carbide and nitride nanoparticles of size ranging from 8 to 12 nm exhibit excellent HER catalytic activity.

The article was first published on 21 Mar 2017
J. Mater. Chem. A, 2017, **5**, 7764-7768
https://doi.org/10.1039/C7TA01815K

Download PDF Article HTML

Communication

A general approach to synthesise ultrathin NiM (M = Fe, Co, Mn) hydroxide nanosheets as high-performance low-cost electrocatalysts for overall water splitting

Xiuhui Sun, Qi Shao, Yecan Pi, Jun Guo and Xiaoqing Huang

A general approach to ultrathin NiM (M = Fe, Co, Mn) hydroxide nanosheets as efficient electrocatalysts for overall water splitting.

The article was first published on 30 Mar 2017
J. Mater. Chem. A, 2017, **5**, 7769-7775
https://doi.org/10.1039/C7TA02091K

Download PDF Article HTML

Communication

Simultaneous enhancement of the molecular planarity and the solubility of non-fullerene acceptors: effect of aliphatic side-chain substitution on the photovoltaic performance

Zhe Zhang, Miao Li, Yahui Liu, Jicheng Zhang, Shiyu Feng, Xinjun Xu, Jinsheng Song and Zhishan Bo

By incorporating aliphatic side chains and adjusting their lengths, non-fullerene acceptors can obtain an improved morphology and photovoltaic performance.

The article was first published on 03 Apr 2017
J. Mater. Chem. A, 2017, **5**, 7776-7783
https://doi.org/10.1039/C7TA02141K

Download PDF Article HTML

metal-free electrocatalysts for overall water-splitting

Xin Yue, Shangli Huang, Junjie Cai, Yanshuo Jin and Pei Kang Shen

N and F dual doped porous graphene nanosheets (NFPGNS).

The article was first published on 04 Apr 2017
J. Mater. Chem. A, 2017, **5**, 7784-7790
https://doi.org/10.1039/C7TA01957B

Download PDF Article HTML

Communication

One-step CVD synthesis of carbon framework wrapped Co_2P as a flexible electrocatalyst for efficient hydrogen evolution

Cui Ye, Min Qiang Wang, Guo Chen, Yang Hui Deng, Ling Jie Li, Hong Qun Luo and Nian Bing Li

Carbon framework wrapped cobalt phosphide on carbon cloth (Co_2P@C/CC) was synthesized *via* one-step CVD as a flexible electrocatalyst for the HER.

The article was first published on 04 Apr 2017
J. Mater. Chem. A, 2017, **5**, 7791-7795
https://doi.org/10.1039/C7TA00592J

Download PDF Article HTML

Communication

Crystallographic orientation propagation in metal halide perovskite thin films

Alexander Z. Chen, Benjamin J. Foley, Jennifer H. Ma, Matthew R. Alpert, J. Scott Niezgoda and Joshua J. Choi

Preferential crystallographic orientation can propagate through metal halide perovskite thin

The article was first published on 11 Apr 2017
J. Mater. Chem. A, 2017, **5**, 7796-7800
https://doi.org/10.1039/C7TA02203D

Download PDF Article HTML

Communication

A fluorinated dialkoxide-based magnesium-ion electrolyte

Jake T. Herb, Carl A. Nist-Lund and Craig B. Arnold

A magnesium-ion battery electrolyte that results in high conductivity, 100% coulombic efficiency, and low overpotentials is presented. The fluorinated dialkoxide-based electrolyte is synthesized *via* a green route without the use of any metal alkyls.

The article was first published on 12 Apr 2017
J. Mater. Chem. A, 2017, **5**, 7801-7805
https://doi.org/10.1039/C7TA01578J

Download PDF Article HTML

Communication

In situ formation of a 3D core/shell structured Ni_3N@Ni–Bi nanosheet array: an efficient non-noble-metal bifunctional electrocatalyst toward full water splitting under near-neutral conditions

Lisi Xie, Fengli Qu, Zhiang Liu, Xiang Ren, Shuai Hao, Ruixiang Ge, Gu Du, Abdullah M. Asiri, Xuping Sun and Liang Chen

An *in situ* electrochemically developed core/shell structured Ni_3N@Ni–Bi nanosheet array behaves as an efficient bifunctional catalyst for overall water splitting.

The article was first published on 10 Apr 2017
J. Mater. Chem. A, 2017, **5**, 7806-7810
https://doi.org/10.1039/C7TA02333B

Download PDF Article HTML

Communication

Molecular engineering of face-on oriented dopant-free hole transporting material for perovskite solar cells with 19% PCE

Kasparas Rakstys, Sanghyun Paek, Peng Gao, Paul Gratia, Tomasz Marszalek, Giulia Grancini, Kyung Taek Cho, Kristijonas Genevicius, Vygintas Jankauskas, Wojciech Pisula and Mohammad Khaja Nazeeruddin

Dopant-free HTM KR321 showed highly ordered characteristic face-on organization leading to increased vertical charge transport and PCE over 19% in PSC with improved stability.

From the themed collection: 2020 Journal of Materials Chemistry Lectureship Winner: Giulia Grancini

The article was first published on 29 Mar 2017
J. Mater. Chem. A, 2017, **5**, 7811-7815
https://doi.org/10.1039/C7TA01718A

Download PDF Article HTML

Paper

Rationally tuning host–guest interactions to free hydroxide ions within intertrimerically cuprophilic metal–organic frameworks for high OH^- conductivity

Ziyin Li, Zhangjing Zhang, Yingxiang Ye, Kaicong Cai, Fenfen Du, Heng Zeng, Jin Tao, Quanjie Lin, Ying Zheng and Shengchang Xiang

Rationally tuning host–guest interactions to free hydroxide ions within intertrimerically cuprophilic MOF for high OH^- conductivity.

From the themed collection: 2017 Journal of Materials Chemistry A HOT Papers

The article was first published on 28 Feb 2017
J. Mater. Chem. A, 2017, **5**, 7816-7824
https://doi.org/10.1039/C6TA11242K

Download PDF Article HTML

Paper

$MnO_2/MnCo_2O_4$/Ni heterostructure with quadruple hierarchy: a bifunctional electrode architecture for overall urea oxidation

Changlong Xiao, Shuni Li, Xinyi Zhang and Douglas R. MacFarlane

A bifunctional core–shell structured $MnO_2/MnCo_2O_4$/Ni electrode with quadruple-hierarchy has been developed for highly efficient overall urea electrolysis.

From the themed collection: 2017 Journal of Materials Chemistry A HOT Papers

The article was first published on 02 Mar 2017
J. Mater. Chem. A, 2017, **5**, 7825-7832
https://doi.org/10.1039/C7TA00980A

Download PDF Article HTML

Paper

Highly efficient photocatalytic hydrogen production from pure water *via* a photoactive metal–organic framework and its PDMS@MOF

Pengyan Wu, Min Jiang, Yang Li, Yanhong Liu and Jian Wang

Photoactive MOF modified with a thin PDMS layer exhibits high stability and ultrahigh photocatalytic efficiency for H_2 production in water.

https://doi.org/10.1039/C7TA01070B

Download PDF Article HTML

Paper

Elucidating the diffusion pathway of protons in ammonium polyphosphate: a potential electrolyte for intermediate temperature fuel cells

Chunwen Sun, Carlos Alberto López and José Antonio Alonso

The diffusion pathway of protons in ammonium polyphosphate is revealed.

The article was first published on 28 Mar 2017
J. Mater. Chem. A, 2017, **5**, 7839-7844
https://doi.org/10.1039/C7TA01404J

Download PDF Article HTML

Paper

Electronic and defect properties of $(CH_3NH_3)_2Pb(SCN)_2I_2$ analogues for photovoltaic applications

Alex M. Ganose, Christopher N. Savory and David O. Scanlon

In this report, we study a range of 2-D perovskite-like compounds $(CH_3NH_3)_2MPs_2X_2$ (M = Sn, Pb; Ps = OCN, SCN, SeCN and X = Cl, Br I), finding suitable band gaps, band alignments and defect behaviour for photovoltaic top cells in tandem devices.

From the themed collection: Recent Open Access Articles

The article was first published on 31 Mar 2017
J. Mater. Chem. A, 2017, **5**, 7845-7853

Download PDF Article HTML

Paper

Phosphorus and oxygen dual-doped graphene as superior anode material for room-temperature potassium-ion batteries

Guangyao Ma, Kangsheng Huang, Jia-Sai Ma, Zhicheng Ju, Zheng Xing and Quan-chao Zhuang

The intercalation of potassium ions into graphitic carbon materials has been demonstrated to be feasible while the electrochemical performance of the potassium-ion battery (PIB) is still unsatisfactory.

The article was first published on 11 Apr 2017
J. Mater. Chem. A, 2017, **5**, 7854-7861
https://doi.org/10.1039/C7TA01108C

Download PDF Article HTML

Paper

Fabrication of PEDOT films *via* a facile method and their application in Pt-free dye-sensitized solar cells

Yin-Chang Li, Song-Ru Jia, Zhi-Yan Liu, Xue-Qin Liu, Yang Wang, Ya Cao, Xiao-Qin Hu, Cheng-Long Peng and Zhen Li

PEDOT films with network-like structures aggregated by plenty of nanoparticles demonstrated good photovoltaic properties.

From the themed collection: 2017 Journal of Materials Chemistry A HOT Papers

The article was first published on 28 Mar 2017
J. Mater. Chem. A, 2017, **5**, 7862-7868

Download PDF Article HTML

Paper

Ruthenium–nickel–nickel hydroxide nanoparticles for room temperature catalytic hydrogenation

Lihua Zhu, Shiyao Shan, Valeri Petkov, Weiwei Hu, Anna Kroner, Jinbao Zheng, Changlin Yu, Nuowei Zhang, Yunhua Li, Rafael Luque, Chuan-Jian Zhong, Hengqiang Ye, Zhiqing Yang and Bing H. Chen

Ru nanoclusters on $Ni/Ni(OH)_2$ nanoparticles supported on carbon ($Ru/Ni/Ni(OH)_2/C$) were successfully prepared and characterized. $Ru/Ni/Ni(OH)_2/C$ exhibited an unprecedented catalytic activity for naphthalene hydrogenation at room temperature due to synergetic catalysis.

The article was first published on 27 Mar 2017
J. Mater. Chem. A, 2017, **5**, 7869-7875
https://doi.org/10.1039/C7TA01437F

Download PDF Article HTML

Paper

High permselectivity hyperbranched polyester/polyamide ultrathin films with nanoscale heterogeneity

Xin Kong, Ze-Lin Qiu, Chun-Er Lin, You-Zhi Song, Bao-Ku Zhu, Li-Ping Zhu and Xiu-Zhen Wei

Incorporating hyperbranched polyesters into a cross-linked polyamide matrix by interfacial polymerization to construct an ultrathin film with high permselectivity performance.

The article was first published on 21 Mar 2017
J. Mater. Chem. A, 2017, **5**, 7876-7884
https://doi.org/10.1039/C7TA00246G

Download PDF Article HTML

Paper

FRET-guided surging of cyanobacterial photosystems improves and stabilizes current in photosynthetic microbial fuel cell

Sharbani Kaushik, Mrinal K. Sarma and Pranab Goswami

A quantum dot-based nano-biocomposite supports FRET to photosystems, biofilm growth and electron relay on the anode in a cyanobacteria-based fuel cell.

The article was first published on 24 Mar 2017
J. Mater. Chem. A, 2017, **5**, 7885-7895
https://doi.org/10.1039/C7TA01137G

Download PDF Article HTML

L. dos Santos-Gómez, J. M. Porras-Vázquez, E. R. Losilla and D. Marrero-López

A $PrBaCo_2O_{5+\delta}$ layered perovskite cathode prepared by an easy and economic spray-pyrolysis deposition method exhibits high performance and stability for low-temperature SOFCs.

The article was first published on 28 Mar 2017
J. Mater. Chem. A, 2017, **5**, 7896-7904
https://doi.org/10.1039/C6TA10946B

Download PDF Article HTML

Paper

Improved carriers injection capacity in perovskite solar cells by introducing A-site interstitial defects

Pengjun Zhao, Wenping Yin, Minwoo Kim, Manhyung Han, Young Jae Song, Tae Kyu Ahn and Hyun Suk Jung

A new strategy to enhance perovskite solar cell performance by introducing potassium cation (K^+) as interstitial site defects.

The article was first published on 25 Mar 2017
J. Mater. Chem. A, 2017, **5**, 7905-7911
https://doi.org/10.1039/C7TA01203A

Download PDF Article HTML

Paper

Redox chemistry of $CaMnO_3$ and $Ca_{0.8}Sr_{0.2}MnO_3$ oxygen storage perovskites

B. Bulfin, J. Vieten, D. E. Starr, A. Azarpira, C. Zachäus, M. Hävecker, K. Skorupska, M. Schmücker, M. Roeb and C. Sattler

Investigation of the redox chemistry and thermodynamics of the perovskites $CaMnO_3$ and

The article was first published on 20 Mar 2017
J. Mater. Chem. A, 2017, **5**, 7912-7919
https://doi.org/10.1039/C7TA00822H

Download PDF Article HTML

Paper

Novel thin-film composite membranes *via* manipulating the synergistic interaction of dopamine and *m*-phenylenediamine for highly efficient forward osmosis desalination

Lina Xu, Jia Xu, Baotian Shan, Xiulin Wang and Congjie Gao

Novel thin-film composite (TFC) membranes were elaborately designed and fabricated *via* the incorporation of mussel-inspired dopamine (DA) into an *m*-phenylendiamine (MPD) aqueous solution on a macroporous substrate.

The article was first published on 27 Mar 2017
J. Mater. Chem. A, 2017, **5**, 7920-7932
https://doi.org/10.1039/C7TA00492C

Download PDF Article HTML

Paper

Polyaniline nanoflowers grown on vibration-isolator-mimetic polyurethane nanofibers for flexible supercapacitors with prolonged cycle life

Ali Khosrozadeh, Mohammad Ali Darabi, Quan Wang and Malcolm Xing

Employing a polyurethane nanofibrous membrane as a cushiony support for the deposition of flower-like polyaniline greatly improves the cycling stability of polyaniline pseudocapacitors.

The article was first published on 24 Mar 2017
J. Mater. Chem. A, 2017, **5**, 7933-7943
https://doi.org/10.1039/C7TA00591A

Download PDF Article HTML

Paper

Nitrogen-doped porous graphene as a highly efficient cathodic electrocatalyst for aqueous organic redox flow battery application

Jianyu Cao, Zhentao Zhu, Juan Xu, Meng Tao and Zhidong Chen

The redox flow battery (RFB) is considered one of the most attractive energy storage technologies because of its high efficiency, long service life and great safety.

The article was first published on 28 Mar 2017
J. Mater. Chem. A, 2017, **5**, 7944-7951
https://doi.org/10.1039/C7TA00873B

Download PDF Article HTML

Paper

Effects of adhesives on the electrochemical performance of monodisperse $LiMn_{0.8}Fe_{0.2}PO_4$/C microspheres as cathode materials for high power lithium-ion batteries

Jianlong Li, Mingwu Xiang, Yan Wang, Jinhua Wu, Hang Zhao and Heng Liu

A facile co-precipitation approach combined with spray-drying and high-temperature calcinations was developed to synthesize $LiMn_{0.8}Fe_{0.2}PO_4$/C microspheres on a large scale.

The article was first published on 17 Mar 2017

Download PDF Article HTML

Paper

Photoswitching storage of guest molecules in metal–organic framework for photoswitchable catalysis: exceptional product, ultrahigh photocontrol, and photomodulated size selectivity

Le Le Gong, Wan Ting Yao, Zhi Qiang Liu, An Min Zheng, Jian Qiang Li, Xue Feng Feng, Lu Fang Ma, Chang Sheng Yan, Ming Biao Luo and Feng Luo

We present a novel MOF catalyst, which shows both ultrahigh photocontrol in catalytic activity and selectivity.

The article was first published on 28 Mar 2017
J. Mater. Chem. A, 2017, **5**, 7961-7967
https://doi.org/10.1039/C7TA01388D

Download PDF Article HTML

Paper

High area-specific capacitance of $Co(OH)_2$/hierarchical nickel/nickel foam supercapacitors and its increase with cycling

Zheyin Yu, Zhenxiang Cheng, Xiaolin Wang, Shi Xue Dou and Xiangyang Kong

Supercapacitors are important energy storage systems due to their high power densities compared to batteries, giving them unique applications.

The article was first published on 28 Mar 2017
J. Mater. Chem. A, 2017, **5**, 7968-7978
https://doi.org/10.1039/C7TA00719A

Download PDF Article HTML

Paper

An efficient microbial fuel cell using a CNT–RTIL based nanocomposite

Leila Mahrokh, Hedayatollah Ghourchian, Kenneth H. Nealson and Mohammad Mahrokh

A woven carbon fiber filament coated with a nanocomposite consisting of amine functionalized multi-walled carbon nanotubes and a room temperature ionic liquid was used as the anode and cathode.

The article was first published on 15 Mar 2017
J. Mater. Chem. A, 2017, **5**, 7979-7991
https://doi.org/10.1039/C6TA09766A

Download PDF Article HTML

desulfurization

Shuting Du, Qiming Sun, Ning Wang, Xiaoxin Chen, Mingjun Jia and Jihong Yu

Hierarchical TS-1 zeolites with abundant intracrystalline mesopores are synthesized and show excellent catalytic performance in oxidizing bulky organic compounds.

The article was first published on 12 Apr 2017
J. Mater. Chem. A, 2017, **5**, 7992-7998
https://doi.org/10.1039/C6TA10044A

Download PDF Article HTML

Paper

Effective calcium doping at the B-site of $BaFeO_{3-\delta}$ perovskite: towards low-cost and high-performance oxygen permeation membranes

Yao Lu, Hailei Zhao, Kui Li, Xuefei Du, Yanhui Ma, Xiwang Chang, Ning Chen, Kun Zheng and Konrad Świerczek

A highly efficient and cost-effective strategy for doping Ca at the B-site of $BaFeO_{3-\delta}$ was demonstrated to enhance oxygen permeability.

From the themed collection: Recent Open Access Articles

The article was first published on 28 Mar 2017
J. Mater. Chem. A, 2017, **5**, 7999-8009
https://doi.org/10.1039/C7TA00907K

Download PDF Article HTML

Paper

Light- and heat-triggered polyurethane based on dihydroxyl anthracene derivatives

To develop materials with self-healing properties, polyurethane (PU) was modified with anthracene derivatives which endowed the PU films with a self-healing ability.

The article was first published on 03 Apr 2017
J. Mater. Chem. A, 2017, **5**, 8010-8017
https://doi.org/10.1039/C7TA00871F

Download PDF Article HTML

Paper

A green and robust solid catalyst facilitating the magnesium sulfite oxidation in the magnesia desulfurization process

Lidong Wang, Tieyue Qi, Siyu Wu, Shihan Zhang, Dan Qi and Huining Xiao

Effect of cobalt loading on the dispersity and catalysis performance.

The article was first published on 29 Mar 2017
J. Mater. Chem. A, 2017, **5**, 8018-8028
https://doi.org/10.1039/C7TA01513E

Download PDF Article HTML

Paper

The role of dissolution in the synthesis of high-activity organic nanocatalysts in a wet chemical reaction

L. J. Liu, Y. D. Lai, H. H. Li, L. T. Kang, J. J. Liu, Z. M. Cao and J. N. Yao

By combining nucleation/growth with dissolution of nanocrystals in a simple wet chemical reaction without capping agent under ambient conditions, a high-activity organic nano-photocatalyst (ZnTPP:H$_2$O) was synthesized by simply adjusting the reaction time

From the themed collection: Recent Open Access Articles

The article was first published on 28 Mar 2017
J. Mater. Chem. A, 2017, **5**, 8029-8036
https://doi.org/10.1039/C7TA00580F

Download PDF Article HTML

Paper

Microwave heating and the fast ADOR process for preparing zeolites

Marta Navarro, Samuel A. Morris, Álvaro Mayoral, Jiří Čejka and Russell E. Morris

Microwave-assisted *vs.* conventional ADOR mechanism in the synthesis of IPC-5, using Scanning Transmission Electron Microscopy (STEM) as a crucial characterisation technique.

From the themed collection: 2017 Journal of Materials Chemistry A HOT Papers

The article was first published on 06 Apr 2017
J. Mater. Chem. A, 2017, **5**, 8037-8043
https://doi.org/10.1039/C7TA02344H

Download PDF Article HTML

Paper

Light-induced generation of free radicals by fullerene derivatives: an important degradation pathway in organic photovoltaics?

L. N. Inasaridze, A. I. Shames, I. V. Martynov, B. Li, A. V. Mumyatov, D. K. Susarova, E. A. Katz and P. A. Troshin

Photochemical degradation of fullerene derivatives producing persistent radical species represents one of the key failure mechanisms of organic solar cells.

From the themed collection: Recent Open Access Articles

The article was first published on 25 Mar 2017
J. Mater. Chem. A, 2017, **5**, 8044-8050
https://doi.org/10.1039/C7TA00175D

Download PDF Article HTML

Paper

Effective charge-discriminated group separation of metal ions under highly acidic conditions using nanodiamond-pillared graphene oxide membrane

Lei Wang, Xinghua Guo, Kecheng Cao, Bo Li, Yang Li, Meicheng Zhang, Rui Wen, Xing Li, Shoujian Li and Lijian Ma

Precise charge-discriminated group separation of coexisting cations in nitric acid solution was achieved by the as-prepared nanodiamond-pillared graphene oxide membrane.

The article was first published on 27 Mar 2017
J. Mater. Chem. A, 2017, **5**, 8051-8061
https://doi.org/10.1039/C7TA00161D

Download PDF Article HTML

Paper

Quick one-pot synthesis of amorphous carbon-coated cobalt–ferrite twin elliptical frustums for enhanced lithium storage capability

Yang Xiang, Hu Wu, Kelvin H. L. Zhang, Mike Coto, Teng Zhao, Sheng Chen, Bitao Dong, Shiyao Lu, Amr Abdelkader, Yuzhen Guo, Yanfeng Zhang, Shujiang Ding, Kai Xi and Guoxin Gao

A novel hierarchical hybrid nanostructure of carbon-coated $CoFe_2O_4$ twin elliptical frustums ($CoFe_2O_4$@C TEFs) has been developed with excellent performance in lithium ion batteries.

Download PDF Article HTML

Paper

Ultrahigh yield of hydrogen peroxide on graphite felt cathode modified with electrochemically exfoliated graphene

Weilu Yang, Minghua Zhou, Jingju Cai, Liang Liang, Gengbo Ren and Lili Jiang

The development of an efficient oxygen reduction reaction (ORR) cathode for hydrogen peroxide production represents an important challenge in the field of electrochemical processes and is highly demanded for chemical industries and environmental remediation applications.

The article was first published on 29 Mar 2017
J. Mater. Chem. A, 2017, **5**, 8070-8080
https://doi.org/10.1039/C7TA01534H

Download PDF Article HTML

Paper

Highly dispersed Co-based Fischer–Tropsch synthesis catalysts from metal–organic frameworks

Bin Qiu, Ce Yang, Wenhan Guo, Yao Xu, Zibin Liang, Ding Ma and Ruqiang Zou

Ultra-small Co nanoparticles embedded in hierarchically porous carbon were made *in situ* from metal–organic frameworks and used as catalysts in the Fischer–Tropsch synthesis.

From the themed collection: 2017 Journal of Materials Chemistry A HOT Papers

The article was first published on 28 Mar 2017
J. Mater. Chem. A, 2017, **5**, 8081-8086

Download PDF Article HTML

Paper

A self-assembled 3D urchin-like $Ti_{0.8}Sn_{0.2}O_2$–rGO hybrid nanostructure as an anode material for high-rate and long cycle life Li-ion batteries

Yutao Dong, Dan Li, Chengwei Gao, Yushan Liu and Jianmin Zhang

Self-assembled 3D urchin-like $Ti_{0.8}Sn_{0.2}O_2$–rGO was fabricated by a one-step hydrothermal process as an anode material for high-rate and long cycle life LIBs.

The article was first published on 29 Mar 2017
J. Mater. Chem. A, 2017, **5**, 8087-8094
https://doi.org/10.1039/C7TA01211J

Download PDF Article HTML

Paper

Reusable Co_xNi_{1-x} dye adsorbents as supercapacitor electrode materials

Haiming Sun, Xijia Yang, Lishu Zhang, Lijun Zhao and Jianshe Lian

A strategy to fabricate an electrode material by sintering a dye sludge consisting of a CoNi adsorbent with Congo Red under a N_2 atmosphere.

The article was first published on 30 Mar 2017
J. Mater. Chem. A, 2017, **5**, 8095-8107
https://doi.org/10.1039/C7TA00578D

Download PDF Article HTML

Paper

Synergistic effect of ceria on the structure and hydrogen evolution activity of nickel nanoparticles grown on reduced graphene oxide

Mohammad Zhiani and Saeedeh Kamali

A facile chemical reduction procedure for the synthesis of nickel nanoparticles on a ceria–reduced graphene oxide composite (ceria–rGO) was reported and the rule of the ceria in HER was discussed.

The article was first published on 13 Apr 2017
J. Mater. Chem. A, 2017, **5**, 8108-8116
https://doi.org/10.1039/C7TA00146K

Download PDF Article HTML

Paper

Improving the photo-oxidative capability of BiOBr *via* crystal facet engineering

Xuelian Wu, Yun Hau Ng, Liang Wang, Yi Du, Shi Xue Dou, Rose Amal and Jason Scott

An increased presence of the {010} facet improved the performance of BiOBr for both water photooxidation and formic acid photodegradation.

The article was first published on 05 Apr 2017
J. Mater. Chem. A, 2017, **5**, 8117-8124
https://doi.org/10.1039/C6TA10964K

Download PDF Article HTML

A chrysanthemum-inspired hierarchical α-MoC_{1-x} hybrid represents an excellent host material for Li^+ ion storage.

The article was first published on 30 Mar 2017
J. Mater. Chem. A, 2017, **5**, 8125-8132
https://doi.org/10.1039/C7TA01256J

Download PDF Article HTML

Cover

Inside back cover

Download PDF

Cover

Back cover

Download PDF

60 items

About Journal of Materials Chemistry A

Materials for energy and sustainability

Editor-in-chief: Anders Hagfeldt
Impact factor: 12.732
Time to first decision (with reviews): 29 days

Submit your article
Opens in new window

Information and templates for authors

Search this journal

Search term, DOI, author

Find an article

Year

e.g. 2022

Page

e.g. 45

Go

Find issues by year (2013 - Present)

2022 - vol. 10

Issue 11, Page 5653 to 6252

Issue 10, Page 5003 to 6652

Issue 9, Page 4459 to 5002

Issue 8, Page 3825 to 4458

Show all issues

Journal of Materials Chemistry B (2013-Present)

Journal of Materials Chemistry C (2013-Present)

Materials Advances (2020-Present)

Journal information

About this Journal

Editorial Board

Subscription Information

Follow | | |

Spotlight

Advertisements

Journal of Materials Chemistry A

COUNTRY

United Kingdom

Universities and research institutions in United Kingdom

SUBJECT AREA AND CATEGORY

Chemistry
Chemistry (miscellaneous)

Energy
Renewable Energy, Sustainability and the Environment

Materials Science
Materials Science (miscellaneous)

PUBLISHER

Royal Society of Chemistry

H-INDEX

212

PUBLICATION TYPE

Journals

ISSN

20507488, 20507496

COVERAGE

2013-2020

INFORMATION

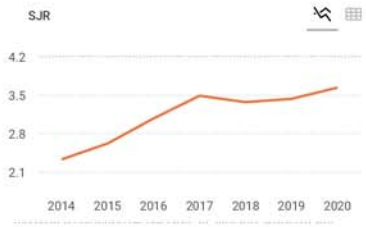
Homepage

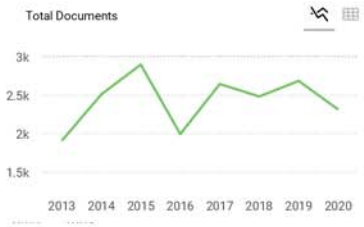
How to publish in this journal

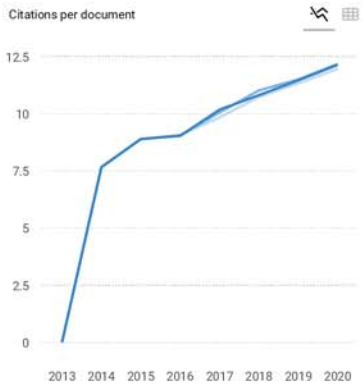
Contact

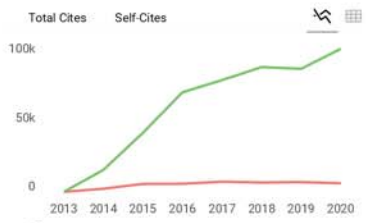
SCOPE

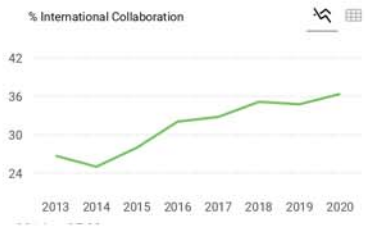
Journal of Materials Chemistry A, B & C cover high quality studies across all fields of materials chemistry. The journals focus on those theoretical or experimental studies that report new understanding, applications, properties and synthesis of materials. The journals have a strong history of publishing quality reports of interest to interdisciplinary communities and providing an efficient and rigorous service through peer review and publication. The journals are led by an international team of Editors-in-Chief and Associate Editors who are all active researchers in their fields. Journal of Materials Chemistry A, B & C are separated by the intended application of the material studied. Broadly, applications in energy and sustainability are of interest to Journal of Materials Chemistry A [...]Example topic areas within the scope of Journal of Materials Chemistry A are listed below. This list is neither exhaustive nor exclusive. Artificial photosynthesis, Batteries, Carbon dioxide conversion, Catalysis, Fuel cells, Gas capture/separation/storage, Green/sustainable materials, Hydrogen generation, Hydrogen storage, Photocatalysis, Photovoltaics, Self-cleaning materials, Self-healing materials, Sensors, Supercapacitors, Thermoelectrics, Water splitting, Water treatment

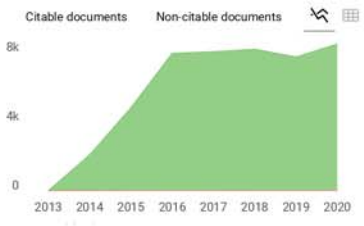


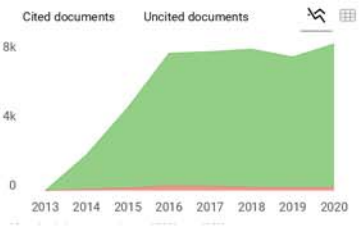












← Show this widget in your own website

Just copy the code below and paste within your html code:

<a href="https://www.scim

SCImago Graphica

Explore, visually communicate and make sense of data with our **new free tool**.

Get it

Metrics based on Scopus® data as of April 2021

S **Shahid** 3 months ago

Does Journal of Materials Chemistry A is gold or green open access journal?

reply

SCImago Team

Melanie Ortiz 2 months ago

Dear Shahid,
Thank you for contacting us.
We suggest you visit the journal's homepage or contact the journal's editorial staff , so they could inform you more deeply.
Best Regards, SCImago Team

Y **Yuvraj Sahu** 2 years ago

Hello and Good Morning .My research area is alkaline oxidation of penicillanic acid derivatives. May I publish my original research work in your highly reputed journal? Would you mind helping me ? I expect positively.

Hoping your stay be safe and fine during this pandemic situation.

reply

SCImago Team

Melanie Ortiz 2 years ago

Dear Yuvraj,
thank you for contacting us.
We are sorry to tell you that SCImago Journal & Country Rank is not a journal. SJR is a portal with scientometric indicators of journals indexed in Elsevier/Scopus.
Unfortunately, we cannot help you with your request, we suggest you visit the journal's homepage (See submission/author guidelines) or contact the journal's editorial staff , so they could inform you more deeply.

Best Regards, SCImago Team

D **dereje fedasa** 2 years ago

how are you?

reply

R **Riyadi Juhana** 2 years ago

submmitte og journal

reply

SCImago Team

Melanie Ortiz 2 years ago

Dear Riyadi, thank you very much for your comment, we suggest you to look for author's instructions/submission guidelines in the journal's website. Best Regards, SCImago Team

Leave a comment

Name

Email
(will not be published)

Submit

The users of Scimago Journal & Country Rank have the possibility to dialogue through comments linked to a specific journal. The purpose is to have a forum in which general doubts about the processes of publication in the journal, experiences and other issues derived from the publication of papers are resolved. For topics on particular articles, maintain the dialogue through the usual channels with your editor.

Developed by: SCImago

Powered by: Scopus

Follow us on @ScimagoJR

EST MODUS IN REBUS

Source details

Journal of Materials Chemistry A

Formerly part of: Journal of Materials Chemistry

Scopus coverage years: from 2013 to Present

Publisher: Royal Society of Chemistry

ISSN: 2050-7488 E-ISSN: 2050-7496

Subject area: Materials Science: General Materials Science | Chemistry: General Chemistry | Energy: Renewable Energy, Sustainability and the Environment

Source type: Journal

CiteScore 2020
19.7

SJR 2020
3.637

SNIP 2020
1.668

View all documents > | Set document alert | Save to source list

CiteScore | CiteScore rank & trend | Scopus content coverage

CiteScore 2020

$$19.7 = \frac{199{,}466 \text{ Citations } 2017 - 2020}{10{,}114 \text{ Documents } 2017 - 2020}$$

Calculated on 05 May, 2021

CiteScoreTracker 2021

$$21.0 = \frac{203{,}774 \text{ Citations to date}}{9{,}713 \text{ Documents to date}}$$

Last updated on 06 March, 2022 • Updated monthly

CiteScore rank 2020

Category	Rank	Percentile
Materials Science General Materials Science	#15/455	96th
Chemistry General Chemistry	#15/398	96th
Energy Renewable Energy	#8/195	96th

View CiteScore methodology > | CiteScore FAQ > | Add CiteScore to your site

About Scopus

What is Scopus
Content coverage
Scopus blog
Scopus API
Privacy matters

Language

日本語に切り替える
切换到简体中文
切換到繁體中文
Русский язык

Customer Service

Help
Tutorials
Contact us