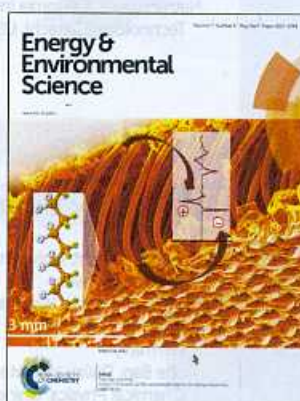


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ISSN 1754-5692 CODEN EESNBY 7(5) 1527-1794 (2014)



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See Mahesh Hariharan *et al.*, pp. 1661–1669. Image reproduced by permission of Mahesh Hariharan from *Energy Environ. Sci.*, 2014, 7, 1661.



Inside cover
See Navneet Soin *et al.*, pp. 1670–1679. Image reproduced by permission of Navneet Soin from *Energy Environ. Sci.*, 2014, 7, 1670.

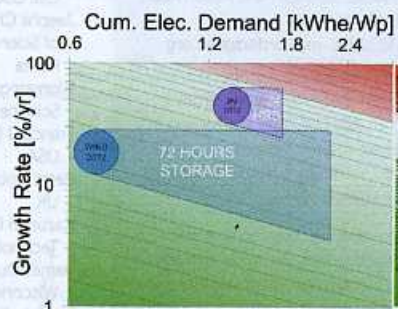
ANALYSIS

1538

Can we afford storage? A dynamic net energy analysis of renewable electricity generation supported by energy storage

Michael Carbajales-Dale,* Charles J. Barnhart and Sally M. Benson

Can society afford to deploy storage to support intermittent renewable generation? A net energy perspective.

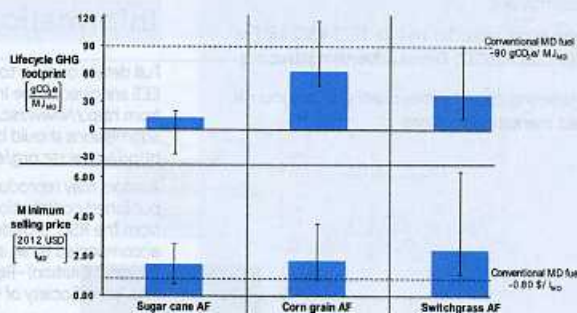


1545

Lifecycle greenhouse gas footprint and minimum selling price of renewable diesel and jet fuel from fermentation and advanced fermentation production technologies

Mark D. Staples, Robert Malina, Hakan Olcay, Matthew N. Pearlson, James I. Hileman, Adam Boies and Steven R. H. Barrett*

A techno-economic analysis of the environmental and economic feasibility of middle distillate fuel production via fermentation and advanced fermentation technologies.



1555

Quantifying the promise of lithium–air batteries for electric vehicles

Kevin G. Gallagher,* Steven Goebel, Thomas Greszler, Mark Mathias, Wolfgang Oelerich, Damla Eroglu and Venkat Srinivasan

A comprehensive materials-to-system analysis demonstrates the lithium–oxygen battery is ill suited for electric vehicles due to the need to contain or purify and deliver the gaseous oxygen reactant.



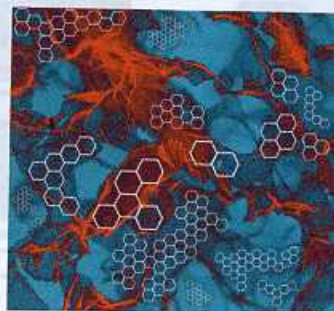
REVIEWS

1564

A review of graphene and graphene oxide sponge: material synthesis and applications to energy and the environment

Victor Chabot, Drew Higgins, Aiping Yu,* Xingcheng Xiao, Zhongwei Chen and Jiujun Zhang*

Graphene sponges prepared by template and free-standing assembly share an ultra-light, conductive, elastic pore network with long-range pore order. Few layer pore walls preserve high surface area and with continued improvements these sponges are being harnessed for enhancement in a rapidly expanding range of applications.

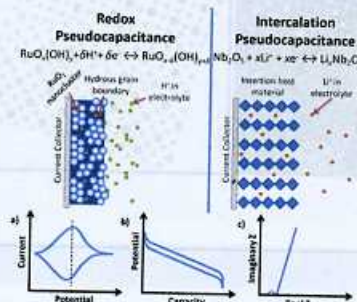


1597

Pseudocapacitive oxide materials for high-rate electrochemical energy storage

Veronica Augustyn, Patrice Simon and Bruce Dunn*

Pseudocapacitive transition metal oxides offer the possibility of high power and high energy density electrochemical energy storage. Here, we review the pseudocapacitive mechanisms, electrochemical features, and most important materials.



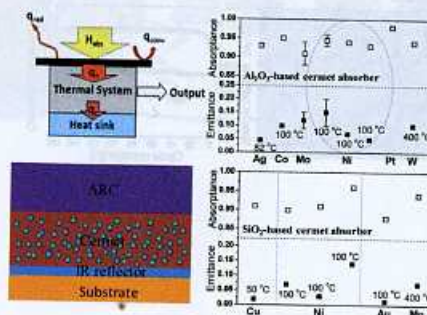
MINIREVIEW

1615

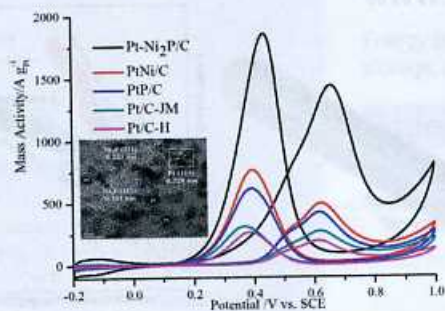
A review of cermet-based spectrally selective solar absorbers

Feng Cao, Kenneth McEnaney, Gang Chen* and Zhifeng Ren*

This review provides detailed theoretical requirements and evaluation standards and a summary of cermet-based spectrally selective solar absorbers for photo-thermal conversion.



1628

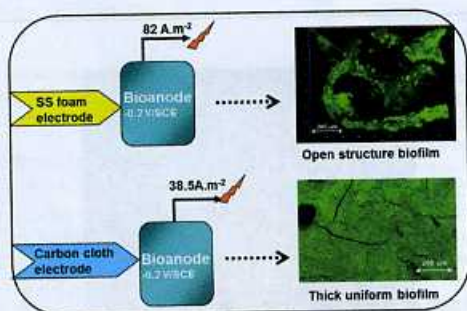


Ni₂P enhances the activity and durability of the Pt anode catalyst in direct methanol fuel cells

Jinfa Chang, Ligang Feng, Changpeng Liu, Wei Xing* and Xile Hu*

Ni₂P promotes the activity and stability of Pt in electrochemical methanol oxidation, resulting in a direct methanol fuel cell with a high power density.

1633

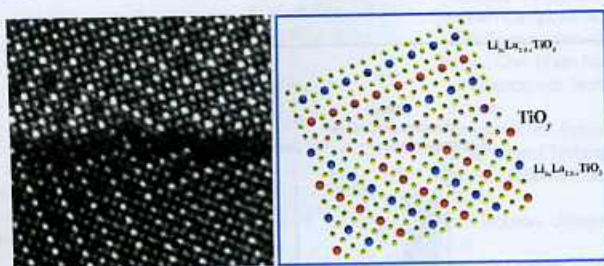


Stainless steel foam increases the current produced by microbial bioanodes in bioelectrochemical systems

Stéphanie F. Ketep,* Alain Bergel, Amandine Calmet and Benjamin Erable

Stainless steel is gaining increasing interest as an anodic material in bioelectrochemical systems and beginning to challenge the more conventional carbon-based materials.

1638

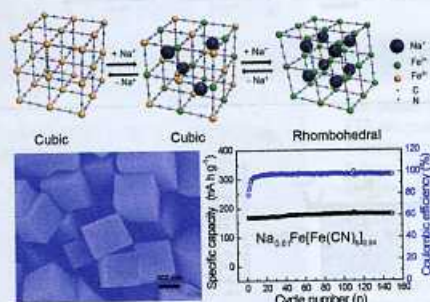


Atomic-scale origin of the large grain-boundary resistance in perovskite Li-ion-conducting solid electrolytes

Cheng Ma, Kai Chen, Chengdu Liang, Ce-Wen Nan, Ryo Ishikawa, Karren More and Miaofang Chi*

The atomic-scale structural and chemical basis for the large grain-boundary resistance in Li conducting oxides was unraveled for the first time.

1643



High-quality Prussian blue crystals as superior cathode materials for room-temperature sodium-ion batteries

Ya You, Xing-Long Wu, Ya-Xia Yin and Yu-Guo Guo*

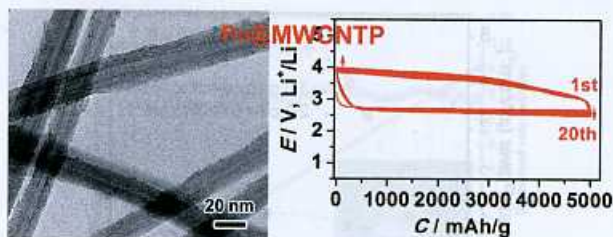
High-quality Prussian blue crystals with a small number of vacancies and a low water content show high specific capacity and remarkable cycle stability as cathode materials for Na-ion batteries.

1648

Performance-improved Li–O₂ battery with Ru nanoparticles supported on binder-free multi-walled carbon nanotube paper as cathode

Fujun Li, Yong Chen,* Dai-Ming Tang, Zelang Jian, Chang Liu, Dmitri Golberg, Atsuo Yamada and Haoshen Zhou*

Ru nanoparticles supported on a multi-walled carbon nanotube paper as a cathode in a Li–O₂ battery can significantly reduce the charge overpotentials, and present a large discharge–charge capacity and stable cycles.

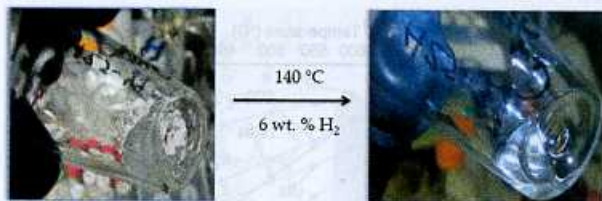


1653

Enabling ammonia-borane: co-oligomerization of ammonia-borane and amine-boranes yield liquid products

Asa E. Carre-Burritt, Benjamin L. Davis,* Brian D. Rekken, Nathan Mack and Troy A. Semelsberger

Slurries of ammonia-borane and functionalized amine-boranes form liquid spent fuels after heating in batch or flow-thru reactors.



1657

Enhanced stability of cobalt catalysts by atomic layer deposition for aqueous-phase reactions

Jechan Lee, David H. K. Jackson, Tao Li, Randall E. Winans, James A. Dumesic, Thomas F. Kuech and George W. Huber*

A thin atomic layer deposition (ALD) TiO₂ coating successfully stabilizes cobalt particles supported on TiO₂ for aqueous-phase hydrogenation (APH) reactions by preventing leaching and sintering of cobalt.



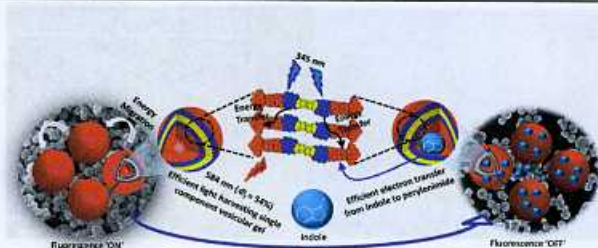
PAPERS

1661

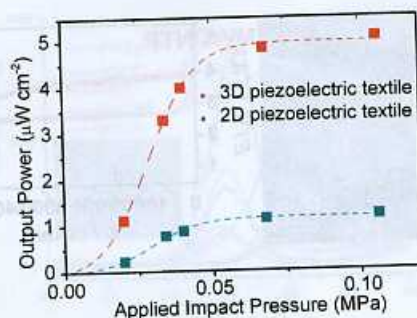
Light harvesting vesicular donor–acceptor scaffold limits the rate of charge recombination in the presence of an electron donor

Rijo T. Cheriya, Ajith R. Mallia and Mahesh Hariharan*

This work highlights the utility of π – π stacked self-assembly for enhanced survival time of charge transfer intermediates upon photoexcitation of donor–acceptor systems.



1670

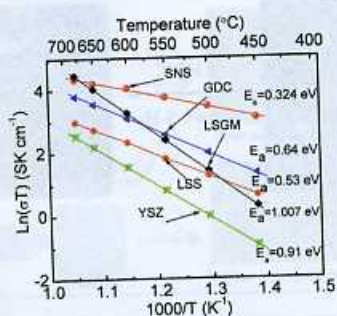


Novel "3-D spacer" all fibre piezoelectric textiles for energy harvesting applications

Navneet Soin,* Tahir H. Shah, Subhash C. Anand, Junfeng Geng, Wiwat Pornwannachai, Pranab Mandal, David Reid, Surbhi Sharma, Ravi L. Hadimani, Derman Vatansever Bayramol and Elias Siores

Using "3D-spacer" technology, we have knitted 80% β -phase PVDF with Ag/PA66 fibres to demonstrate all fibre piezoelectric power generators. The 3D structure provides a power density of $1.10\text{--}5.10 \mu\text{W cm}^{-2}$ at applied impacts of $0.02\text{--}0.10 \text{ MPa}$.

1680

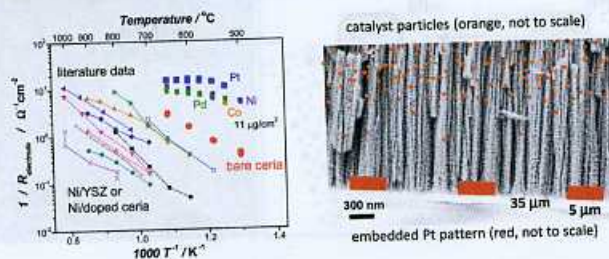


$\text{Sr}_{3-3x}\text{Na}_{3x}\text{Si}_3\text{O}_{9-1.5x}$ ($x = 0.45$) as a superior solid oxide-ion electrolyte for intermediate temperature-solid oxide fuel cells

Tao Wei, Preetam Singh, Yunhui Gong, John B. Goodenough, Yunhui Huang and Kevin Huang*

A new solid oxide-ion conductor $\text{Sr}_{3-3x}\text{Na}_{3x}\text{Si}_3\text{O}_{9-1.5x}$ ($x = 0.45$) exhibits the highest oxide-ion conductivity with the lowest activation energy among all the known chemically stable oxide-ion conductors.

1685

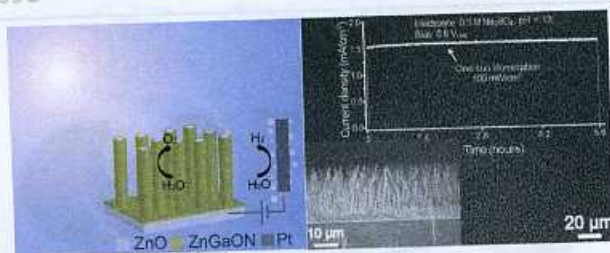


Robust nanostructures with exceptionally high electrochemical reaction activity for high temperature fuel cell electrodes

WooChul Jung, Kevin L. Gu, Yoonseok Choi and Sossina M. Haile*

Combination of nanostructured ceria and nanoscale metal particles leads to unprecedented activity for hydrogen and methane electro-oxidation along with excellent morphological stability.

1693



A conductive ZnO-ZnGaON nanowire-array-on-a-film photoanode for stable and efficient sunlight water splitting

Miao Zhong, Yanhang Ma, Peter Oleynikov, Kazunari Domen and Jean-Jacques Delaunay*

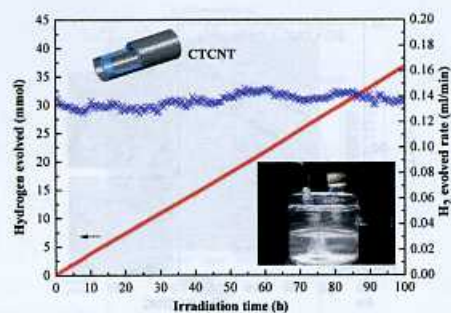
We report highly stable and efficient sunlight water splitting on a ZnO-ZnGaON nanowire-array-on-a-film photoanode without the assistance of any co-catalyst.

1700

A novel composite of TiO₂ nanotubes with remarkably high efficiency for hydrogen production in solar-driven water splitting

Caixian Zhao, Hean Luo,* Feng Chen, Ping Zhang,* Lanhua Yi and Kuiyi You

CTCNT exhibits a super-high solar-driven hydrogen production rate ($37.6 \text{ mmol h}^{-1} \text{ g}^{-1}$) with an AQE approaching 100% in the ultraviolet light region.

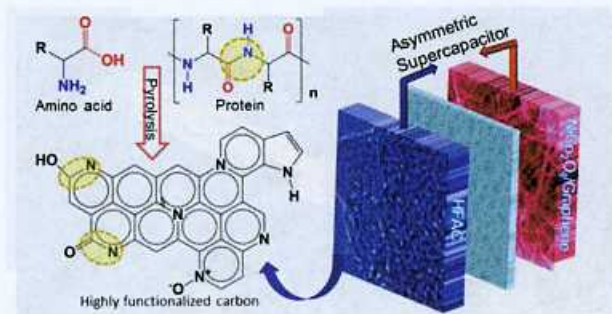


1708

Colossal pseudocapacitance in a high functionality–high surface area carbon anode doubles the energy of an asymmetric supercapacitor

Zhi Li, Zhanwei Xu, Huanlei Wang,* Jia Ding, Benjamin Zahiri, Chris M. B. Holt, Xuehai Tan and David Mitlin*

A highly functionalized activated carbon with a colossal pseudocapacitance of more than 500 F g^{-1} was derived from biomass and used to boost the energy of an asymmetric supercapacitor tremendously.

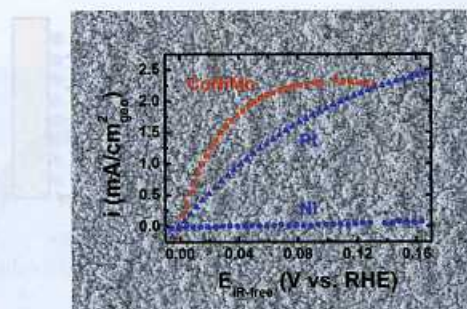


1719

Non-precious metal electrocatalysts with high activity for hydrogen oxidation reaction in alkaline electrolytes

Wenchao Sheng, Adam P. Bivens, MyatNoeZin Myint, Zhongbin Zhuang, Robert V. Forest, Qianrong Fang, Jingguang G. Chen* and Yushan Yan*

Polarization curves of hydrogen oxidation on a Pt disk, electroplated Ni and CoNiMo multimetallic layer.



1725

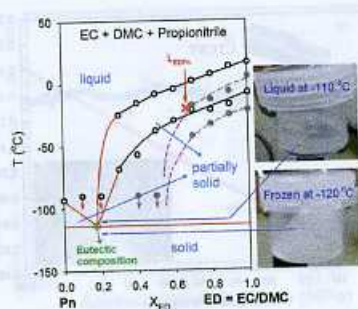
Structure formation in P3HT/F8TBT blends

Alessandro Sepe, Zhuxia Rong, Michael Sommer, Yana Vaynzof, Xiaoyuan Sheng, Peter Müller-Buschbaum, Dettlef-M. Smilgies, Zhi-Kuang Tan, Le Yang, Richard H. Friend, Ullrich Steiner* and Sven Hüttner*

The structure evolution of all-polymer solar cells based on the blends of poly(3-hexylthiophene) (P3HT) and poly[(9,9-dioctylfluorene)-2,7-diyl-*alt*-(4,7-bis(3-hexylthien-5-yl)-2,1,3-benzothiadiazole)-2',2''-diyl] (F8TBT) was investigated.



1737

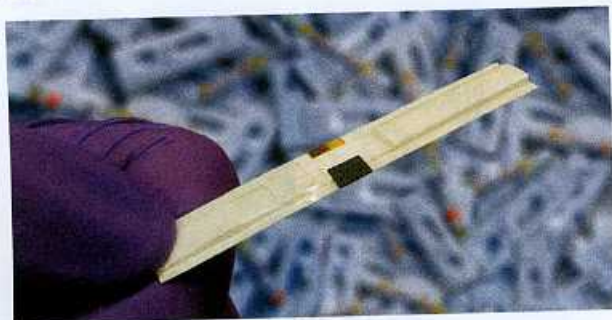


Nitrile-assistant eutectic electrolytes for cryogenic operation of lithium ion batteries at fast charges and discharges

Yoon-Gyo Cho, Young-Soo Kim, Dong-Gil Sung, Myung-Su Seo and Hyun-Kon Song*

The charge/discharge characteristics of lithium ion batteries at low temperature (LT = $-20\text{ }^{\circ}\text{C}$) are enhanced by using ethylene carbonate (EC)-based electrolytes with the help of nitriles as assistant solvents.

1744

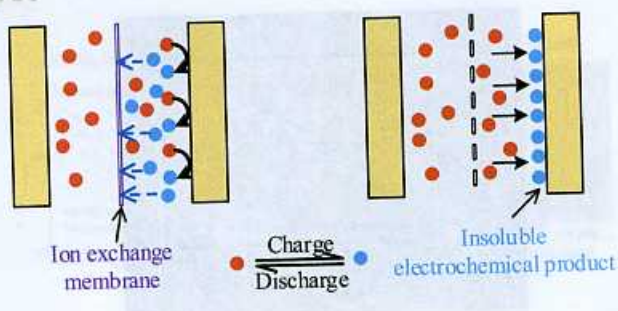


Microfluidic fuel cells on paper: meeting the power needs of next generation lateral flow devices

J. P. Esquivel,* F. J. Del Campo, J. L. Gómez de la Fuente, S. Rojas and N. Sabaté

Microfluidic fuel cells as paper-based power sources in a standard lateral flow test format.

1750

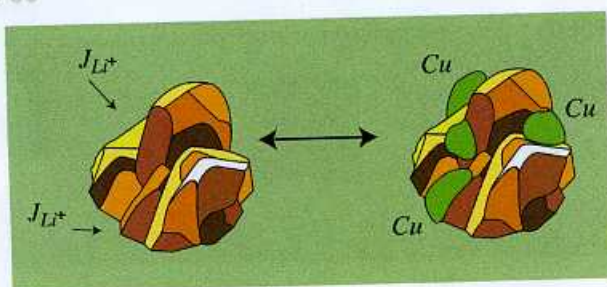


Mechanism investigation and suppression of self-discharge in active electrolyte enhanced supercapacitors

Libin Chen, Hua Bai,* Zhifeng Huang and Lei Li*

The mechanism of self-discharge (SDC) in active electrolyte enhanced supercapacitors was investigated, and two strategies were devised to suppress the SDC process.

1760



Designing the next generation high capacity battery electrodes

H.-C. Yu, C. Ling, J. Bhattacharya, J. C. Thomas, K. Thornton and A. Van der Ven*

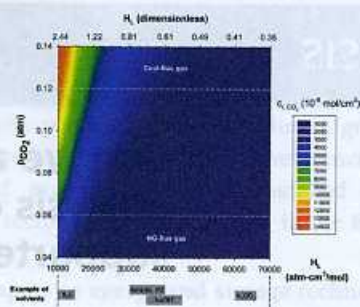
Much of current research in electrochemical energy storage is devoted to new electrode chemistries and reaction mechanisms that promise substantial increases in energy density.

1769

Revisiting film theory to consider approaches for enhanced solvent-process design for carbon capture

Jennifer Wilcox,* Panithita Rochana, Abby Kirchofer, Guenther Glatz and Jiajun He

Optimal solvent performance is dependent upon the concentration of CO_2 in a gas mixture.



1786

'Dry bases': carbon dioxide capture using alkaline dry water

Robert Dawson, Lee A. Stevens, Orla S. A. Williams, Weixing Wang, Benjamin O. Carter, Sam Sutton, Trevor C. Drage, Frédéric Blanc, Dave J. Adams and Andrew I. Cooper*

An alkaline form of 'dry water'—a 'dry base'—is prepared by the high-speed mixing of aqueous solutions of metal carbonates or organic amines with hydrophobic silica nanoparticles.



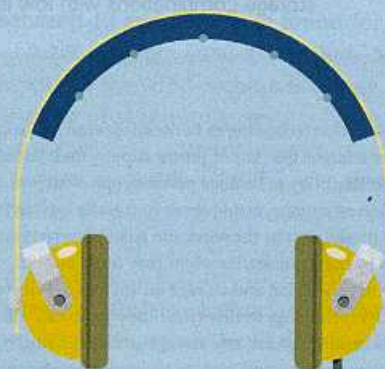
Hydrophobic nanosilica + potassium carbonate solution
 →
 Mixing at 37,000 rpm for 30 seconds



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