Molecular layer deposition for energy conversion and storage

What is atomic layer deposition & molecular layer synthesis?
Atomic layer deposition (ALD) and molecular layer deposition (MLD) are two attractive synthesis routesthat,by relying on gas-solid surface reactions,have the potential to address the shortcomings of conventional chemistry routes when it comes to controllability and scalability.

What is molecular layer deposition (MLD)?
As an extension of atomic layer deposition (ALD),molecular layer deposition (MLD),has recently emerged as a thin-film coating techniquethat can enable the development of high-performance materials in energy-related applications. MLD fabrication can be classified into two categories: polymer-based organics and inorganic-organic hybrid materials.

Who presented molecular organic - inorganic hybrid materials by atomic layer deposition?
O. Nilsen,H. Nielsen,K. B. Klepper and H. Fjellvåg,Molecular organic - inorganic hybrid materials by atomic layer deposition,Oral presentation at E-MRS Fall Meeting 2007,Symposium C,by Ola Nilsen. S. M. George,A. A. Dameron,Y. Du,N. M. Adamczyk and S. D. Davidson,ECS Trans.,2007,11,81-90 CAS.

What are energy storage and conversion systems?
Energy storage and conversion systems,including batteries,supercapacitors,fuel cells,solar cells,and photoelectrochemical water splitting,have played vital roles in the reduction of fossil fuel usage,addressing environmental issues and the development of electric vehicles. The fabrication and surface/

What determines the optimal deposition temperature?
In sum, the range within which the deposition temperature can be chosen is set by the ALD chemistry of choice. Once the range is defined, the optimal temperature depends on the nature of the substrate, the desired morphology, and energy consumption considerations.

Can plasma and ozone be used to deposition pt thin films?
In order to circumvent this limitation the use of plasma and ozone has been explored.115,126-129 However,plasma processes are mainly suitablefor the deposition of Pt thin films and NPs on flat substrates,and their applications on substrates with complex geometries such as powders are still limited. ALD of Pd.

Films by Molecular Layer Deposition for Rechargeable Batteries Jian Liu1* and Jiajun Wang2* ... for energy storage and conversion systems (Sundberg and Karppinen, 2014; Meng, 2017). For example ...

1 Introduction. Energy conversion and storage have become global concerns with the growing energy demand. 1 Layer structured materials, with crystal structures similar to that of graphite (i.e., weak van der Waals interactions between adjacent layers, strong covalent bonding within the intralayer) have attracted increasing

attention for many energy-related applications. ...

The demand for high-performance devices that are used in electrochemical energy conversion and storage has increased rapidly. Tremendous efforts, such as adopting new materials, modifying existing materials, and producing new structures, have been made in the field in recent years. Atomic layer deposition (ALD), as an effective technique for the deposition of ...

Atomic/molecular layer deposition for energy storage and conversion. Chem. Soc. Rev., 50 (2021), pp. 3889-3956. Crossref View in Scopus Google Scholar [5] ... Molecular layer deposition for energy conversion and storage. ACS Energy Lett., 3 (2018), pp. 899-914. Crossref View in Scopus Google Scholar [19]

Elevated levels of carbon dioxide (CO 2) in the atmosphere and the diminishing reserves of fossil fuels have raised profound concerns regarding the resulting consequences of global climate change and the future supply of energy.Hence, the reduction and transformation of CO 2 not only mitigates environmental pollution but also generates value-added chemicals, ...

Atomic layer deposition (ALD) and molecular layer deposition (MLD) techniques, the gas-phase thin film deposition processes with self-limiting and saturated surface reactions, have emerged ...

1 Atomic/Molecular Layer Deposition for Energy Storage and Conversion Yang Zhao1+, Lei Zhang1+, Jian Liu2+, Keegan Adair1, Feipeng Zhao1, Yipeng Sun1, Tianpin Wu3, Xuanxuan Bi4, Khalil Amine4, Jun Lu4*, Xueliang Sun1* 1Department of Mechanical & Materials Engineering, University of Western Ontario, London, ON, N6A 5B9, Canada 2School of Engineering, ...

The development of nanoscale coatings with well-controlled properties is critical to the future of nanotechnology for energy applications. As an extension of atomic layer deposition (ALD), molecular layer deposition (MLD), has recently emerged as a thin-film coating technique that can enable the development of high-performance materials in energy-related applications.

New materials hold the key to advances in energy conversion and storage. Nanoscale materials possess nanoscale (1-100 nm) structures externally or internally 1; in particular they offer unique properties that are central for the energy transition in our society from heavily relying on fossil fuels to renewable energy sources. 2 While realizing there are other ...

As shown in Fig. 6a, the device consists of an energy conversion device on the upper layer and an energy storage device on the lower layer. The PN junction is placed in the middle of the two-layer devices to ensure unidirectional transport of the generated current. Among them, the energy conversion device is designed according to the Seebeck ...

Abstract The demand for high-performance devices that are used in electrochemical energy conversion and

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Department of Materials Science & State Key Laboratory of Molecular Engineering of Polymers, Fudan University, Shanghai, 200438, China; ... The demand for high-performance devices that are used in electrochemical energy conversion and storage has increased rapidly. Tremendous efforts, such as adopting new materials, modifying existing materials ...

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MXenes, with general formula M n+1 X n T x, (where n = 1-4; M = early transition metals; X = C, N, or a combination of both; T x = surface functional groups like -OH, -O, -F, or -Cl) are a diverse group of two-dimensional (2D) layered transition metal carbides, nitrides and carbonitrides. Due to the energy and environmental problems, the renewable energy ...

His current research interests focus on atomic layer deposition and molecular layer deposition for energy storage and conversion. Dr. Mohammad Norouzi Banis is a research engineer in Prof. Xueliang (Andy) Sun"s group at the University of Western Ontario, Canada.

Atomic layer deposition (ALD) and molecular layer deposition (MLD) are two attractive synthesis routes that, by relying on gas-solid surface reactions, have the potential to address the shortcomings of conventional chemistry routes when it comes to controllability and scalability. ... photonics, catalysis, and energy conversion and storage ...

The supercapacitor structure for energy storage requires a large specific surface area to achieve high performance. Engineering of the preparation and material properties of structures on the nanoscale is essential for achieving a better performance of energy storage devices [1,2]. With the high specific surface area and good wettability, ions ...

Global demands for clean energy storage and delivery continue to push developing technology to its limits. Batteries and supercapacitors are among the most promising technologies for electrical ...

To keep pace with the miniaturization of next generation devices in applications such as electronics, biotechnology, and energy, their constituent polymer thin films must meet challenging requirements such as providing simultaneously ultrathin and conformal coatings. Traditional polymer deposition methods may not be suitable, and as a result, new fabrication ...

structure and achieving optimal performance for the energy storage and conversion application. In this review, as shown in Fig.1, we will deeply discuss the unique techniques of atomic layer ...

Elevated levels of carbon dioxide (CO 2) in the atmosphere and the diminishing reserves of fossil fuels have raised profound concerns regarding the resulting consequences of global climate change and the future supply of energy.Hence, the reduction and transformation of CO 2 not only mitigates environmental pollution but also generates value-added chemicals, providing a dual ...

With the depletion and increasing environmental impacts of the traditional fuels, such as coal and petroleum products, the emerging global challenge in both energy and environment fields has prompted intensive research on renewable energy-conversion and energy-storage systems, such as fuel cells, electrolyzers, and supercapacitors, as well as various ...

Atomic and molecular layers play significant roles at nanoscales in the processes of energy conversion, energy transfer and energy storage, which dominates the carrier collection efficiency, the chemical reaction rate, the sensitivity, capacity, stability, and reliability of the optoelectronic devices used in the applications of photovoltaic ...

Atomic layer deposition (ALD) and molecular layer deposition (MLD) techniques, the gas-phase thin film deposition processes with self-limiting and saturated surface reactions, have emerged as powerful techniques for surface and interface engineering in energy-related devices due to their exceptional capability of precise thickness control ...

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