sulfur-deposition-on-carbon-nanofibers-using-supercritical-co2-by-infinity-turbine

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This webpage QR code

Sulfur Deposition on Carbon Nanofibers using Supercritical CO2

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Sulfur Deposition on Carbon Nanofibers using Supercritical CO2. Gamma sulfur also known as mother of pearl sulfur and nacreous sulfur.

PDF Version of the webpage (first pages)

https://infinityturbine.com/sulfur-deposition-on-carbon-nanofibers-using-supercritical-co2-by-infinity-turbine.html

Lithium Sulfur Battery Research using Vapor Deposition of Sulfur on Carbon Nanofiber

Lithium Sulfur Battery Research using Vapor Deposition of Sulfur on Carbon Nanofiber: One interesting application may be for the research and production of lithium sulfur batteries. Using CO_2 may be one possible route to commercialization of production. (The team found that during the process of depositing sulfur on the carbon nanofiber surface, changing it from a gas to a solid, it crystallized in an unexpected way, forming a slight variation of the element, called monoclinic gamma-phase sulfur - link below.)
The modular construction of the system allow easy integration for new technology developments, and multi-role add-ons. The heart of the system is the phase change liquid pumping techniques, flow bar, and tribo effect electrostatic precipitation collection system. Many of these deployed technologies were developed by Infinity since 2015 making this system the most advanced in the industry. More than 100 of these commercial systems have been built and out around the world. Gamma sulfur also known as mother of pearl sulfur and nacreous sulfur, which was first prepared by F.W. Muthmann in 1890.

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Supercritical CO2 Vapor Disposition

History of γ-sulfur.

First prepared by F.W Muthmann in 1890, is sometimes called nacreous sulfur or mother of pearl sulfur because of its appearance. It crystallizes in pale yellow monoclinic needles. It contains puckered S8 rings like Alpha-sulfur and Beta-sulfur and only differs from them in the way that these rings are packed. It is the densest form of the three. It can be prepared by slowly cooling molten sulfur that has been heated above 150 C or by chilling solutions of sulfur in carbon disulfide, ethyl alcohol or hydrocarbons. It is found in nature as the mineral rosickyite Rosickyite is a rare native element mineral that is a polymorph of sulfur. It crystallizes in the monoclinic crystal system and is a high temperature, high density polymorph. It occurs as soft, colorless to pale yellow crystals and efflorescences.

Monoclinic Gamma-phase Sulfur

Abstract: Here, we stabilize a rare monoclinic γ-sulfur phase within carbon nanofibers that enables successful operation of Lithium-Sulfur (Li-S) batteries in carbonate electrolyte for 4000 cycles. Carbonates are known to adversely react with the intermediate polysulfides and shut down Li-S batteries in first discharge. Through electrochemical characterization and post-mortem spectroscopy/ microscopy studies on cycled cells, we demonstrate an altered redox mechanism in our cells that reversibly converts monoclinic sulfur to Li2S without the formation of intermediate polysulfides for the entire range of 4000 cycles. To the best of our knowledge, this is the first study to report the synthesis of stable γ-sulfur and its application in Li-S batteries. We hope that this striking discovery of solid-to-solid reaction will trigger new fundamental and applied research in carbonate electrolyte Li-S batteries.

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Electrospinning

How to make carbon nanofiber.

More soon...

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One-Pot Synthesis of Carbon Nanofibers from CO2

Carbon nanofibers, CNFs, due to their superior strength, conductivity, flexibility, and durability have great potential as a material resource but still have limited use due to the cost intensive complexities of their synthesis. Herein, we report the high- yield and scalable electrolytic conversion of atmospheric CO2 dissolved in molten carbonates into CNFs. It is demonstrated that the conversion of CO2 → CCNF + O2 can be driven by efficient solar, as well as conventional, energy at inexpensive steel or nickel electrodes. The structure is tuned by controlling the electrolysis conditions, such as the addition of trace transition metals to act as CNF nucleation sites, the addition of zinc as an initiator and the control of current density. A less expensive source of CNFs will facilitate its adoption as a societal resource, and using carbon dioxide as a reactant to generate a value added product such as CNFs provides impetus to consume this greenhouse gas to mitigate climate change.

KEYWORDS: Carbon nanofibers, carbon composites, carbon capture, climate change, solar energy

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