Porous silicon supercapacitor

What is a porous silicon supercapacitor?
Our porous Si supercapacitor devices exhibit almost ideal double layer capacitor characteristic with electrode volumetric capacitance of 7.3 F/cm. Several orders of magnitude increase in power and energy density is obtained comparing to uncoated porous silicon electrodes.

Can porous Si based supercapacitor electrodes be used in integrated microsupercapacitors?
Abstract: We demonstrate high performance porous Si based supercapacitor electrodes that can be utilized in integrated micro supercapacitors. The key enabler here is ultra-thin TiN coating of the porous Si matrix leading to high power and stability.

Why are silicon materials unused for supercapacitors?
Scientific Reports 3,Article number: 3020 (2013) Cite this article Silicon materials remain unused for supercapacitors due to extreme reactivity of silicon with electrolytes.

What is a supercapacitor based on a grass-like alumina nanoelectrode?
Isakov et al. (2022) investigated a supercapacitor based on grass-like alumina nanoelectrodes and porous silicon, producing 5-11 mF cm 2 of areal capacitance and stability. They used industrially manufactured PS. In this context, associating nickel oxide with PS presents many advantages.

Can silicon be used as a high performance electrochemical capacitor?
Overall,the specific use of silicon as an earth-abundant material capable of being transformed into a high performance electrochemical capacitorthrough application of a thin surface coating opens new avenues both toward grid-scale and integrated device applications.

Should supercapacitors be used as electrodes?
Si itself, due to its prominence, would be a suitable candidate as a material for electrodes. Despite their performances, they still present shortcomings when put against batteries; hence, a lot of focus is put on increasing the performance of supercapacitors.

Development of porous silicon supercapacitors is reviewed including the first publications and discussion on the main advantages and problems related to porous silicon electrodes. Various passivation techniques of the surface, such as sputtering of metals, graphene coating, and atomic layer deposition, are described. ...

x-coated carbonized porous silicon nanowires for high-performance supercapacitor electrode materials. The excep-tional performance of a supercapacitor device based on this hybrid electrode architecture in an organic electrolyte/organic salt is demonstrated for the first time. Porous silicon nanowires

We demonstrate high performance porous Si based supercapacitor electrodes that can be utilized in integrated

micro supercapacitors. The key enabler here is ultra-thin TiN coating of the porous Si matrix leading to high power and stability. The TiN layer is deposited by atomic layer deposition (ALD), which provides sufficient conformality to reach the bottom of the high aspect ratio ...

Surface engineered porous silicon for stable, high performance electrochemical supercapacitors Landon Oakes 1,4, Andrew Westover, Jeremy W. Mares2, Shahana Chatterjee1, William R. Erwin3,

Here, we demonstrate a universal route to transform porous silicon (P-Si) into stable electrodes for electrochemical devices through growth of an ultra-thin, conformal ...

In this work, we enhance the capacitance of porous silicon (PS) supercapacitor electrodes up to 4× by adding a new high-surface-area nanoelectrode on the existing topography, thus forming a hierarchical 3D supercapacitor electrode that can be used in micro-supercapacitor applications. The nanoelectrode is based on grass-like alumina (GLA ...

The electrochemical applications of porous silicon-based materials in energy conversion reactions and energy storage applications in lithium-ion batteries and ...

P-Si is demonstrated as a promising new platform for grid-scale and integrated electrochemical energy storage and a technique generalizable to mesoporous and nanoporous materials that decouples the engineering of electrode structure and electrochemical surface stability to engineer performance in electrochemical environments is demonstrated. Silicon ...

Using porous silicon coated with graphene, material scientists at Vanderbilt University have developed the first supercapacitor that is made out of silicon. Solar cells produce electricity 24/7, not just when the sun is shining. ...

Development of porous silicon supercapacitors is reviewed including the first publications and discussion on the main advantages and problems related to porous silicon electrodes. Various passivation techniques of the surface, such as sputtering of metals, graphene coating, and atomic layer deposition, are described.

Electrical double layer (EDL) supercapacitors have been constructed using gold coated porous silicon (PSi) electrodes in a 0.25 M TEABF 4 /PC solution. As a comparison with the PSi, ...

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