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香港城市大學
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Scalable Synthesis of Two-dimensional Hydrogen-substituted Graphdiyne

Communications & Information

Manufacturing

Energy Conservation/Generation/Management/Storage (Battery)

Smart Mobility and Electric Vehicle

Opportunity

Carbon materials offer a variety of exceptional properties that make them highly desirable for many different industries. Generally speaking, the properties of carbon materials are determined by their structures, while their structures are in turn related to how the materials are synthesized. Different methods of preparing carbon materials can yield different structures and thus affect the performance of the materials in particular applications.

As a rising star in the field of carbon materials, hydrogen-substituted graphdiyne (HsGDY) exhibits excellent structural and chemical stability, and thus promises enormous potential for fields such as energy storage and conversion, e.g., various secondary batteries and electrocatalysis, contributing to the implementation of current low-carbon society. However, the current methodology of synthesizing HsGDY suffers serious drawbacks. This invention provides a new synthesis method of high-quality HsGDY that eliminates the disadvantages of contemporary synthesis methodologies. The invention outlined here therefore clears the way for future HsGDY research and investment.

IP Status
Patent granted

Technology Readiness Level (TRL) 4

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Technology

Current methods of synthesizing HsGDY exhibit either porous morphology (that is, a non-two-dimensional morphology) or an amorphous crystalline structure. With these features, the resulting HsGDY does not demonstrate the advantages that it has the theoretical potential to achieve. Moreover, synthesizing high-quality HsGDY using current methodologies still suffers from low yields, making the resulting products unsuitable for mass production.

This invention addresses these problems by utilizing zinc as a catalytic substrate. This allows the resulting HsGDY to exhibit both two-dimensional morphology and high crystallinity. In addition, since zinc powder has a high surface area, this approach exhibits much higher yields, thereby reducing production costs.

Advantages

- This invention produces HsGDY that exhibits strong structural integrity.

- The HsGDY synthesized by this invention exhibits high degrees of crystallinity.
- This method of synthesizing HsGDY can produce much higher yields than other methods of synthesis.

Applications

- Energy storage
- Energy conversion