Carbon-Based Materials for Use in Supercapacitors

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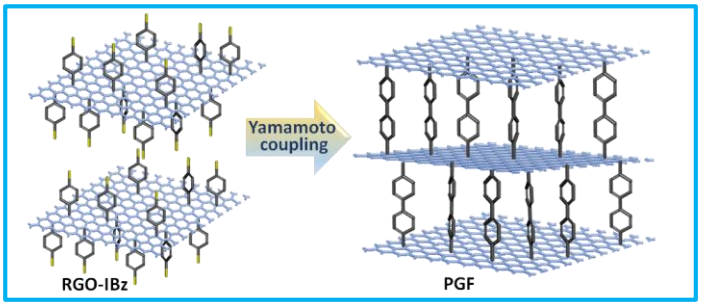
Outline

Graphene, a two-dimensional monolayer of sp^2-carbon atoms arranged in a honeycomb network, is considered as one of the most promising candidates for the electrode materials of electrochemical capacitors due to its high maximum specific-surface area (~2600 $m^2\ g^{-1}$) and superior electrical conductivity, combined with excellent mechanical properties and outstanding chemical stability. Herein, microporous, pillared graphene-based frameworks (PGF) are generated in a simple functionalization/coupling procedure starting from reduced graphene oxide and have been used for the fabrication of high performance supercapacitor devices. Moreover, conjugated microporous polymer-graphene (G-CMP) sandwiches have been synthesized using 4-iodophenyl-substituted graphene as structure-directing template. Hierarchically, porous nanosheets with high specific surface area are readily obtained by direct pyrolysis of the G-CMP sandwiches. The novel carbon hybrid materials display a very promising capacitive performance in supercapacitor devices.



Scheme 1. Synthesis strategy for the generation of PGF.

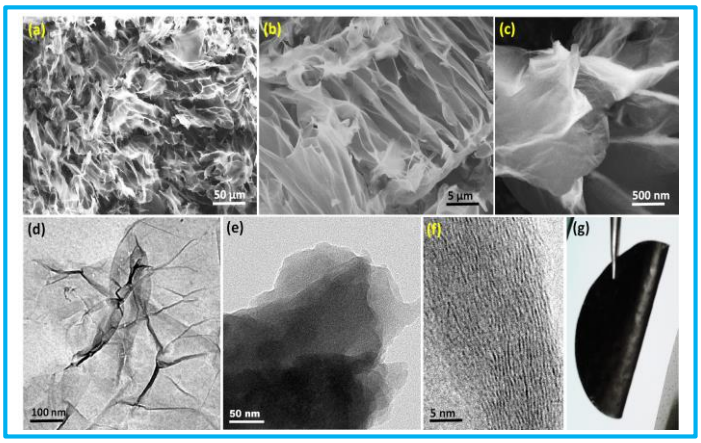


Figure 1. SEM, TEM and HRTEM images of PGF.

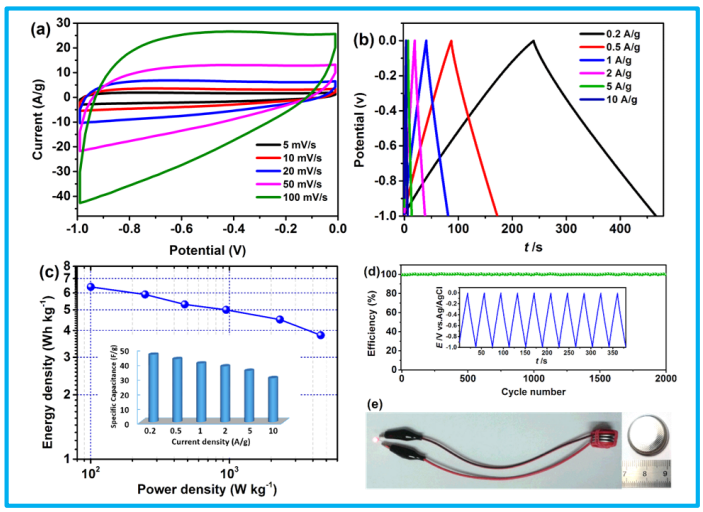


Figure 2. Electrochemical characterization of PGF-based supercapacitor devices.

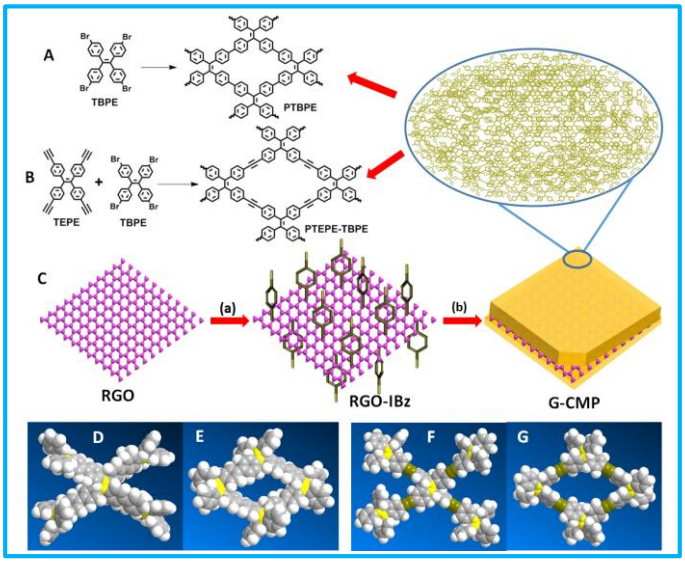


Figure 3. Process of generating CMPs and graphene-templated CMPs.

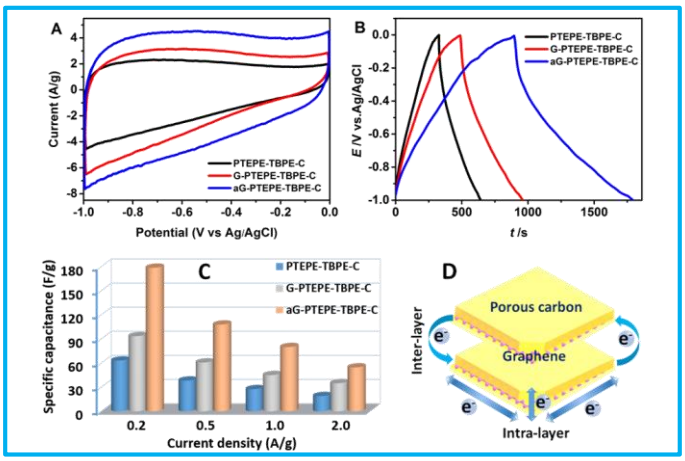


Figure 4. Electrochemical Properties of Carbon Materials.

Conclusions

- Microporous, pillared graphene-based frameworks are generated and have been used for the fabrication of high performance supercapacitor devices.
- Hierarchically, porous carbon nanosheets with promising supercapacitive performance are prepared in a straightforward procedure.

Acknowledgment

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References

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