

Supporting Information

Greatly improving energy storage density and reducing dielectric loss of carbon nanotube/cyanate ester composites through building unique tri-layered structure with mica paper

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Table S1 Dielectric constants of multi-layer structure composites in literature. ^{a)}

| Conductor ^{b)} (content, wt%) | Polymer matrix ^{c)} | Insulating Layer ^{d)} | Number of layers | Dielectric constant (100 Hz) | Dielectric loss (100 Hz) | Improvement of energy storage density ^{e)} | Ref |
|---|---------------------------------|-----------------------------------|---------------------|------------------------------------|--------------------------------|---|--------------|
| CNF (3) | PVDF | PVDF | 3 | ~79 | ~0.21 | / | S1 |
| GO (20) | PVDF | BST/PVDF | 3 | ~23 | ~0.08 | ~230% | S2 |
| CNT (10) | PI | PI | 3 | 31(1kHz) | 0.0016 | <40% | S3 |
| CNT (0.6) | CE | PE | 2 | <168 | ~0.007 | / | S4 |
| CB (15) | PP | PP | 128 | 128 | / | / | S5 |
| CB (15) | PVDF | PVDF | 256 | ~69 | 0.05 | / | S6 |
| GPN (/) | CP | CP | 3 | ~55 | ~0.08 | / | S7 |
| CNT sheet (2.2) | PVDF | PVDF | 3 | 32 | 0.08 | / | S8 |
| CNT (0.6) | PVDF | PVDF | 3 | ~12 | ~0.09 | / | S9 |
| GR (20.3vol%) | PVDF | BT/PVDF | 3 | ~93 | <0.05 | / | S10 |
| CNT (0.6) | CEP | MP | 3 | 219 | 0.4 | 1550% | this work |

- a) Multi-layer composites are composed of conductor/polymer layer and insulation layer. Some properties not reported directly in the references are derived from the corresponding curves, so the symbol “~” was used to indicate the datum is an approximate value.
- b) CNF: Carbon nanofiber.
GO: Graphene oxide.
CNT: Carbon nanotube.
CB: Carbon black.
GPN: Graphene.
CNT sheet: Prepared by floating catalyst CVD growth method.
GR: Graphite.
- c) PVDF: Poly(vinylidene fluoride).
PI: Polyimide.
CE: Cyanate ester.
PP: Polypropylene.
CP: 12 wt% cyanoethyl pullulan polymer.
CEP: Epoxy modified cyanate ester.
- d) BST: Ba_{0.6}Sr_{0.4}TiO₃.
- e) The magnitude of the increase compared to the energy storage density of conductor/polymer composite. The symbol “/” represents no data reported in the literature.

References

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