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A HIGH-CAPACITY GRAPHENE/MESOCARBON MICROBEAD COMPOSITE ANODE FOR LITHIUM-ION BATTERIES

Inna SMOLIANOVA, Jin-long HU, Xin-yue ZHAO, Viacheslav DEMENTIEV, Ling-zhi ZHANG

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Research purposes and novelty

- Introduction of a novel graphene/mesocarbon microbead anode material, which combines the advantages of highly-conductive graphene and cycling stability of mesocarbon microbead.
- Synergistic effect revealed between graphene and mesocarbon microbead benefits the electrochemical performance of composite electrode compared with reference electrodes

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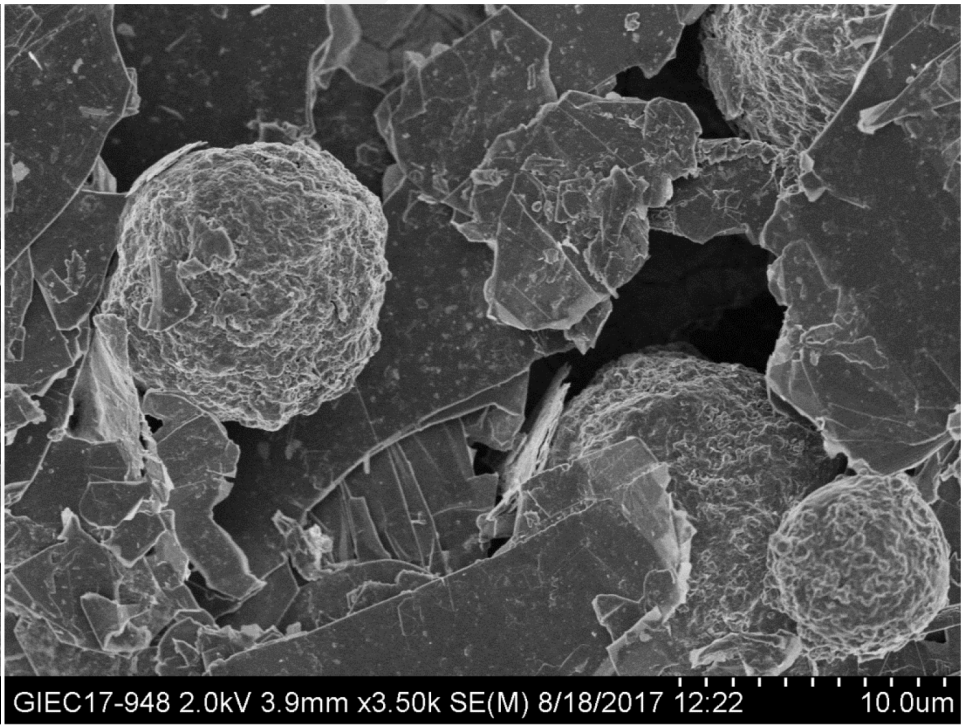
Preparation procedures

- Graphene/mesocarbon microbead composite was prepared by mixing of graphene and MCMB in weight ratios of 7:3, 8:2, and 9:1. Composite electrodes GMC 7:3, GMC 8:2 , and GMC 9:1, along with reference electrodes of graphene and MCMB, were prepared by mixing the active material, conducting agent (acetylene black) and polyvinylidene fluoride (PVDF) binder in a 90:5:5 weight ratio.

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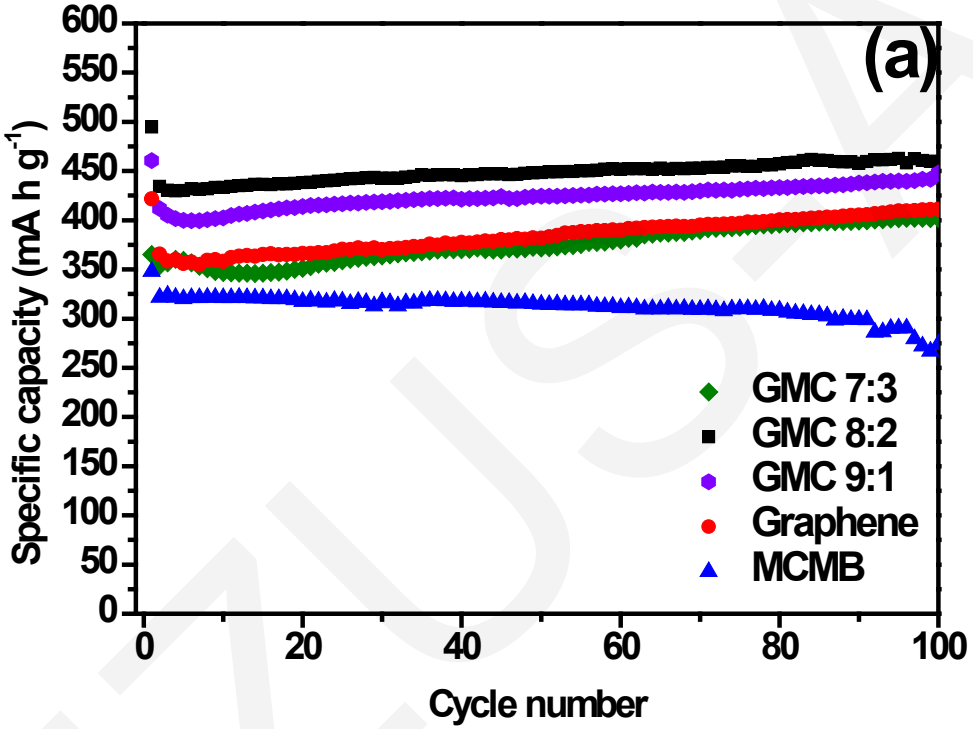
Morphology of graphene and graphene/mesocarbon microbead composite





Mesocarbon microbead fills in the big cavities provided by the structure of graphene

Cycling performance



- Large size of pristine graphene particles results in large voids and poor interparticle contact . MCMB fills in the voids, providing better electrical contact and enlarging the electrode/electrolyte surface for lithium storage. Among composite electrodes, graphene/MCMB (8:2 w/w) shows the best electrochemical performance. A combination of 80% of graphene and 20% of MCMB also provides more condensed packing of the electrode (in comparison with GMC (9:1 w/w)), while GMC (7:3 w/w) electrode has lower capacity due to excessive MCMB content.