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Carbon nanoweb-based metal anode for sodium rechargeable batteries

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Because of its remarkably high theoretical capacity and favourable redox voltage (−2.71V vs. the standard hydrogen electrode), Na is a promising anode material for Na ion batteries. In this study, microporous catalytic carbon nano templates (MC-CNTs) based on nanoweb-structured carbon nanofibers with various carbon microstructures are prepared from microbe-derived cellulose via simple heating at 800 or 2400°C. MC-CNTs prepared at 800°C have amorphous carbon structures with numerous topological defects and exhibit a lower voltage overpotential of ~8mV in galvanostatic charge/discharge testing. In addition, MC-CNT-800s exhibit high Coulombic efficiencies of 99.4-99.9% during consecutive cycling at current densities ranging from 0.2 to 4 mA cm^{-2}. However, the carbon structures of MC-CNTs prepared at 800 °C are gradually damaged by cycling. This results in significant capacity losses after about 200 cycles. In contrast, MC-CNTs prepared at 2400 °C exhibit well-developed graphitic structures and maintain predominantly stable cycling behaviours over 1000 cycles with coulombic efficiencies of ~99.9%. This study demonstrates the superiority of catalytic carbon nano templates with well-defined pore structures and graphitic microstructures for use in Na metal anodes.

Speaker Biography

Young Soo Yun has completed his Ph.D. degree from Inha University, South Korea. He is the professor of Kangwon National University, South Korea. He has over 100 publications that have been cited over 2,000 times, and his publication h-index is 21. His specific research field is carbon-based electrochemistry for energy storage.

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