NOVEL D-GLUCOSE DERIVED HARD CARBON ANODE FOR SODIUM-ION BATTERIES

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The synthesis and characterization of a hard carbon anode material for room-temperature sodium-ion battery is being reported. The carbon material was prepared via two-step process including hydrothermal carbonization (HTC) and pyrolysis. Similar carbon materials were recently synthesized and investigated by our group as supercapacitor electrode materials [1,2]. Sodium-ion batteries have emerged as a promising candidate for large-scale energy storage due to sodium's abundance and low cost of raw materials. However, significant work is needed on the development of Na-ion intercalation anodes [3,4].

The electrode slurry was prepared by mixing the active material, conductive additive (Super P) and polyvinylidene difluoride (PVdF) binder in 75:15:10 mass ratio. The mixed slurry was cast onto copper foil using doctor-blade technique. The cast electrodes were dried under vacuum for 24h. The half-cells (EL-Cell GmbH) were assembled and electrolyte mixtures prepared in an Argon-filled glovebox (O_2 < 0.1 ppm, H_2O < 0.1 ppm). Sodium metal was used as counter and reference electrode and 1M $NaClO_4$ in propylene carbonate (PC) as the electrolyte.

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References

1. R. Väli, A. Jänes, T. Thomberg, E. Lust, *J. Electrochem. Soc.*, **163,** A1619 (2016).
2. T. Thomberg, T. Tooming, T. Romann, R. Palm, A. Jänes, and E. Lust, *J. Electrochem. Soc.*, **160**, A1834 (2013).
3. J. P. Meyers, M. Doyle, R. M. Darling, and J. Newman, *J. Electrochem. Soc.*, **147**, 2930 (2000).
4. R. Scipioni, P. S. Jørgensen, D.-T. Ngo, S. B. Simonsen, Z. Liu, K. J. Yakal-Kremski, H. Wang, J. Hjelm, P. Norby, S. A. Barnett, and S. H. Jensen, *J. Power Sources*, **307**, 259 (2016).

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