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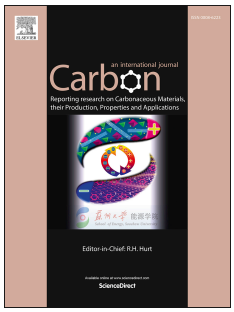

One-pot synthesis of nanostructured carbon materials from carbon dioxide via electrolysis in molten carbonate salts

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One-Pot Synthesis of Nanostructured Carbon Materials from Carbon Dioxide via Electrolysis in Molten Carbonate Salts

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Abstract

As the primary culprit of greenhouse effect, carbon dioxide has garnered global attention, and the technologies currently being developed to reduce the emission of CO_2 vary widely. In this study, CO_2 was electrochemically reduced in various molten mixtures of Li-Na-K carbonates to carbon nanomaterials. By regulating the electrolysis current density, electrolyte, and electrolytic temperature, the carbon products had different morphologies of honeycomb-like and nanotubular structures. A transition from a honeycomb/platelet to nanomaterial carbon morphology was observed to occur at ~600°C with increase in temperature. The observation of nanostructures is consistent with a higher diversity of structures possible with enhanced rearrangement kinetics that can occur at higher temperature. A high yield of a carbon nanotube (CNT) was not observed from a Li-Na-K electrolyte, no CNTs are formed from a Na-K carbonate electrolyte, but a high yield is observed from pure Li, or mixed Li-Na or mixed Li-Ba carbonate electrolytes, and the carbon nanotube product diameter is observed to increase with increasing electrolysis time.

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