

Carbon Films Produced from Ionic Liquid Precursors

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Technology Summary

Researchers at ORNL have invented a more effective method of preparing thin carbon films, a material that has become increasingly important to the development of energy-saving storage batteries. Using this new method, it is possible to produce a very resilient, thermally stable porous carbon film characterized by a highly ordered arrangement of uniformly sized pores.

Conventional polymer carbon precursors are typically in solid form and must first be dissolved in a solvent. This is a time-consuming process that can introduce imperfections into the carbon film. Another drawback is that the high viscosity of polymer precursors makes it difficult to apply them as a coating on a substrate. Non-polymer liquid molecules can be easily applied, but they are also highly volatile and, in the end, yield little or no carbon.

The new ORNL method eliminates these problems by using an ionic liquid precursor that contains at least one unsaturated carbon–nitrogen bond in either or both of the cationic and anionic portions of the ionic liquid. The extensive cross linking that takes place between carbon precursor molecules during heat processing ensures that the method produces porous carbon films with a highly ordered arrangement of pores and/or highly uniform pore size. These ionic liquid, non-polymer molecules possess both the low vapor pressures and the high char formation capabilities of polymers, under typical carbonization conditions.

Advantages

- Non-polymer ionic liquid molecules can be used as carbon precursors
- Ionic liquid precursors exhibit the same low vapor pressures and high char formation capabilities of polymers, without the time-intensive processing
- Porous, thin carbon films produced have a highly ordered arrangement of pores and/or highly uniform pore size

Potential Applications

- Separations
- Catalysis
- Battery components for energy storage

Patent

Sheng Dai and Huimin Luo. *Carbon Films Produced from Ionic Liquid Carbon Precursors*, U.S. Patent Application 12/726,548, filed March 18, 2010.

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