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Green preparation of carbon-silica composites

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Recently, the preparation and use of mesoporous carbon-silica composites have received significant attention. Carbon is conductive and hydrophobic, while silica is insulating and hydrophilic. The carbon-silica composite can allow for remarkable and complementary properties that cannot be achieved by either individual component. Bio-oil from microwave fast pyrolysis of biomass or waste materials can contain numerous oxygenated organic compounds, including aldehydes, ketones, phenols, esters, sugars and furans. Research has demonstrated the utilization of bio-oils as an energy source for fossil fuel substitution and as a feedstock for chemicals. Herein, bio-oil is demonstrated as a sustainable and bio-based source of carbon for the development of carbon-silica composites. This simple, environmentally benign and novel process facilitates the production of highly functionalised and unique materials. The properties of these resulting materials can be tuned by the variation of temperatures leading to a continuum of functionalities ranging from polar hydroxyl rich surface to carbonaceous aromatic surfaces. Moreover, the physical and chemical properties of this composite could be tuned by simply adjusting the ratio of carbon and silica. Nitrogen adsorption porosimetry, XRD and microscopy analysis of the resultant composite indicate that these materials still possess high specific surface areas, narrow pore size distributions and ordered mesostructure. These exciting new materials may open new doors to sustainable materials for the electronics industry.

Biography

Tengyao Jiang finished his master study in Green Chemistry Centre of Excellence in University of York in 2011, and he continued to PhD study of green synthesis and modification of mesoporous silica materials by using green techniques, working with Dr. Andrew J. Hunt and Dr. Duncan J. Maccquarrie.

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