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Properties of green solvents and their applications in green chemistry

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Many conventional chemical processes result in environmental pollution and are sustainable. Green chemistry is the future of chemistry and chemical industry. Effective utilization of green solvents, such as water, supercritical fluids (SCFs), ionic liquids (ILs), liquid polymers, switchable solvents is an important area of green chemistry. The use of green solvents provides additional control factors for optimizing different chemical processes. Recently, much attention has been paid to the properties and applications of green solvents in extraction and fractionation, chemical reactions, and material synthesis. Many processes that use green solvents have been commercialized. The field of green solvents has a very bright future and there are many challenges from both fundamental and practical point of view. In recent years, we are very interested in physicochemical properties of green solvents and their applications in green chemistry, which include mainly: 1) phase behavior, intermolecular molecular interaction, and the microstructures in complex SCFs, ILs, supercritical (SC) CO_2/IL systems; 2) colloid and interface science of green solvent systems, including chemical thermodynamics, microstructures, and functions; 3) effects of phase behavior and intermolecular interactions on the properties of chemical reactions in SC CO_2, ILs, SC CO_2/water, water/ILs, and SC CO_2/ILs; 4) synthesis of highly efficient catalytic materials using green solvents; 5) development of greener routes for the transformation of CO_2, biomass and aromatics into value-added chemicals in green solvents, and the optimization of the reaction processes using the designable and tunable features of green solvents. In this presentation, I would like to discuss some recent results.

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Carbon fibers from plant-derived material

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Because of the Kyoto protocols on CO_2 emission reduction, the transition towards a bio-based economy and sustainable developments offers high perspectives for natural fibers markets. Several kinds of natural fibers exist around the world: bamboo in Japan, coconut in equatorial countries. They are supposed to be one of the strongest natural fibers available in nature. Biochar based carbon and graphene nanostructures are very perspective raw materials for nano profiling and nano-modification of composites for the promising applications in material industry. Considering continues, growing global carbon fibers (CFs) demand various applications, investigation of the possibility to use the natural fibers to carbon fibers studied. Pyrolysis method was adopted for conversion. The aim of the study was to use affordable, easily available, environment-friendly material to produce carbon fibers. These carbon fibers may become, in perspective, substitutes for traditional polymeric precursors for CFs. Carbonized Fibers were studied by FESEM, Raman and TGA. Various applications like the mechanical strength of composite were studied further. Results show that biochar based carbon fibers prove themselves as potential fillers in composite.

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