Facile and novel method for synthesizing of renewable carbon nanoparticles from lignin

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Nowadays, the utilization of waste biomass is important for energy and material innovation. Carbon nanoparticles were synthesized from renewable, cheap and waste materials of industrial lignin using supercritical antisolvent (SAS) process followed by thermal stabilization and carbonization. The SAS process was employed for developing of lignin nanoparticles using dimethylformamide (DMF) as a solvent and subcritical carbon-dioxide (CO_2) as an antisolvent. The effects of CO_2 temperature, pressure and inject velocity, and solute concentration on the behavior of lignin and carbon particles formation were evaluated through FTIR, DSC, SEM, HR-TEM and surface area analysis (BET). The results showed that the synthesized lignin and carbon particles were highly monodispersed in water and nanoscale particles (<5 nm) with lattice parameter of d spacing graphene layer imaged by HR-TEM. This study demonstrates that lignin and carbon nanoparticles were successfully synthesized using a facile, economically and environmentally method which can efficiently produce in industrial scale.