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Green production of silica nanoparticles from maize stalk

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Abstract

Amorphous silica has been produced from some agricultural wastes but with drawbacks on agglomeration challenges. In the present study, potential of maize stalk (MS) wastes as a source of nano silica was studied through modified sol-gel techniques, which involved acid pretreatment, calcination, leaching, sol-gel modification, and post-filtration treatments. Nano silica particles obtained were characterized by XRD, SEM, EDS, TEM, PSA, Raman, and FT-IR for morphology, elemental composition, particle size, and surface chemistry. Results obtained revealed that pre-calcination acid treatment of the MS did not improve the silica yield but reduced the Van der Waal's interaction of the silica particles resulting in silica particles with a smaller degree of agglomeration. Sodium silicate modified with ethylene glycol sol-gel treatment prior to titration reduced silica agglomeration. Silica nanoparticles obtained according to XRD, TEM, and PSA are below 30 nm.

Keywords: Maize stalk, silica, nanoparticle, agglomeration, morphology

Additional information

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